JANUARY, 1929

In Two Sections

Section One

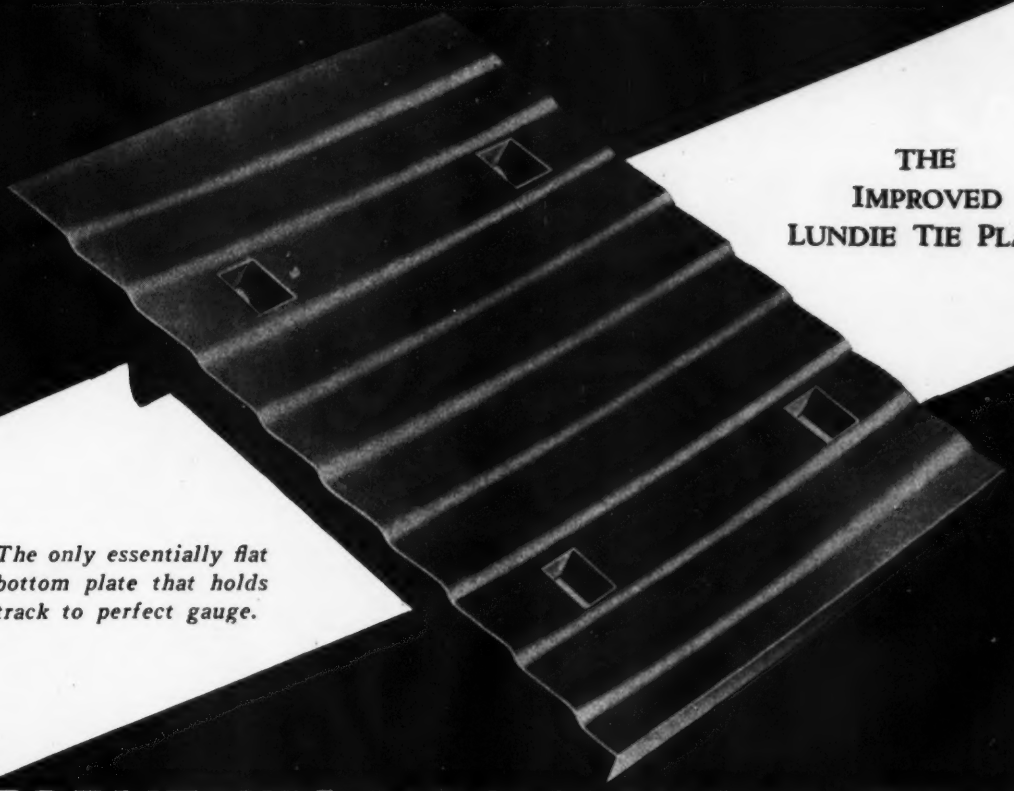
Railway Engineering and Maintenance

The FAIR Attained And Maintains World Supremacy
—Designed with unapproachable simplicity—
—Made of metals with characteristics best adapted for use in Rail Anti-Creepers—
—Manufactured by an experienced and expert production organization—
That's why the FAIR Rail Anti-Creeper attained and maintains World Supremacy.
THE P. & M. CO.
"EVERYWHERE"

One Test
Is Sufficient to convince maintenance engineers that HY-CROME insures greater rail joint protection for a lower cost than the ordinary nut lock.
Performance reports show that there is less wear on the joint parts and less rail batter on the track equipped with HY-CROME.
There are no entries under the headings "breakage during application" and 'failures in service". HY-CROME is made of the finest grade of electric alloy steel procurable.
A laboratory test is sufficient to prove the superiority of HY-CROME—a service test is still more convincing.
Make arrangements for an early test this year.
THE RELIANCE MFG. CO.
MASSILLON, OHIO
HY-CROME

RAILWAY ENGINEERING AND MAINTENANCE
Published monthly by Simmons-Boardman Publishing Co., at 105 W. Adams St., Chicago. Subscription price: United States, Canada and Mexico, $2.00; foreign countries, $3.00 a year. Single copy, 35 cents. Entered as second class matter January 13, 1916, at the postoffice at Chicago, Illinois, under the Act of March 3, 1879.
Alphabetical Index to Advertisers, Page 60 Classified Index to Advertisers, 56-58

The ONE TIE PLATE
free from destructive projections
THAT INSURES MAXIMUM TIE LIFE



THE
IMPROVED
LUNDIE TIE PLATE

The only essentially flat bottom plate that holds track to perfect gauge.

PREVENTS MECHANICAL WEAR

THE constantly increasing use of creosoted cross ties makes imperative a more serious consideration of tie plate design. Any slab of metal with miscellaneous projections will no longer answer.

The vast number of Lundie Tie Plates in service under all conditions of traffic demonstrates that track can be held to gauge without the use of destructive ribs. The elimination of such projections is vitally important. It prevents excessive cutting of ties which not only destroys the wood fibres but starts and accelerates decay by permitting moisture to penetrate into the untreated wood.

The Lundie Tie Plate is a proven economic device which insures maximum return from tie investments. It will pay you to investigate the Lundie design.

The Lundie Engineering Corporation
285 Madison Ave., New York
166 West Jackson Boulevard, Chicago

LUNDIE TIE PLATE

Fairmont

RAILWAY MOTOR

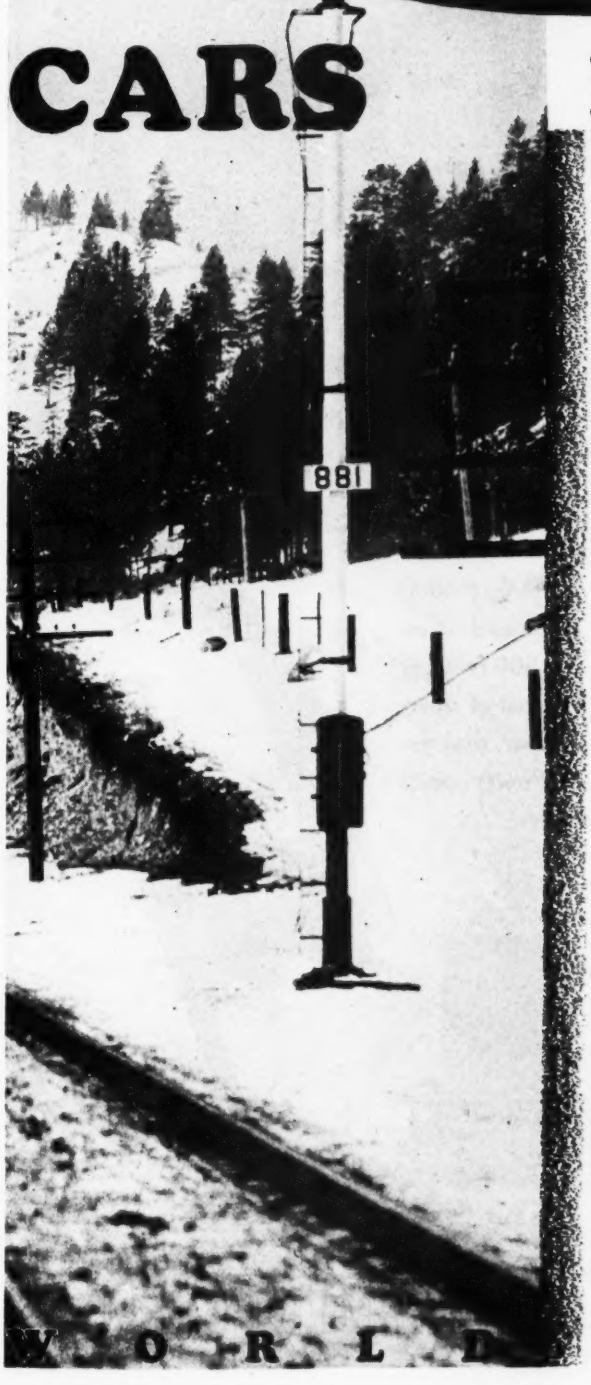
WS2—Bigger Engine, 8-12 H. P. Seats ten men; housing tips up for servicing; Endless Cord Belt Drive.

Performance on the Job Counts

THE RAILROAD

AND Mudge CARS

Performance in all kinds of weather



Snows, rains, 40 below zero or 110 in the shade . . in all kinds of weather . . under the most trying conditions, Fairmont and Mudge Motor Cars have been serving steadily, faithfully, efficiently.

They are the minute men of the rails, always ready, never flinching, always anxious to serve.

Today more than half of all the motor cars in use are Fairmont products. An appreciated tribute to "Performance on the Job."

FAIRMONT RAILWAY MOTORS, INC.
General Offices: FAIRMONT, MINN.
General Sales Offices: CHICAGO, ILL.
Branch Offices: New York City; Washington, D.C.; St. Louis; San Francisco; New Orleans; Winnipeg, Can.; Mexico City, Mex.
BALDWIN LOCOMOTIVE WORKS
Foreign Representative

FAIRMONT AND MUDGE PRODUCTS

SECTION MOTOR CARS
A2—M2—S2—M14—WS2

INSPECTION MOTOR CARS
E14—C1—M19—MM9

WEED MOWERS AND DISCERS
M24—M23

WEED BURNERS
B(M27)—C(M27)

GANG AND POWER CARS
MT2—A4—A5

PUSH CARS AND TRAILERS
T1—T2—T3—T12—T20—T24—T25

ROLLER AXLE BEARINGS
Ringsealed-Axlsaver—Bower—Hyatt—Timken

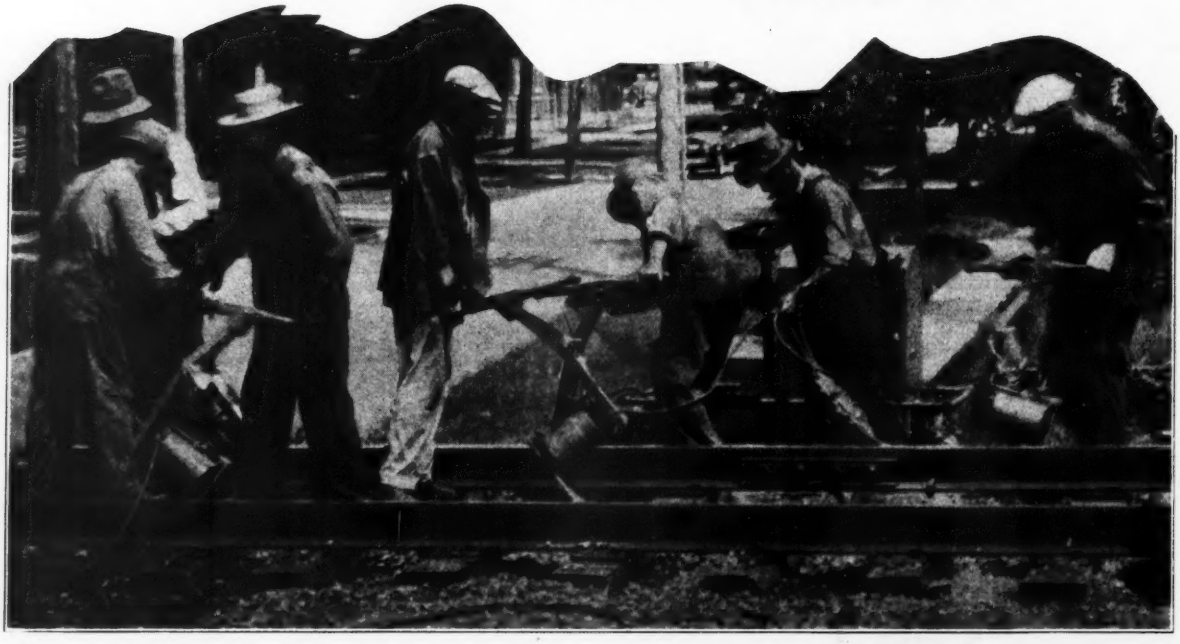
MOTOR CAR ENGINES
QB—PHB—PHA—QHB and W

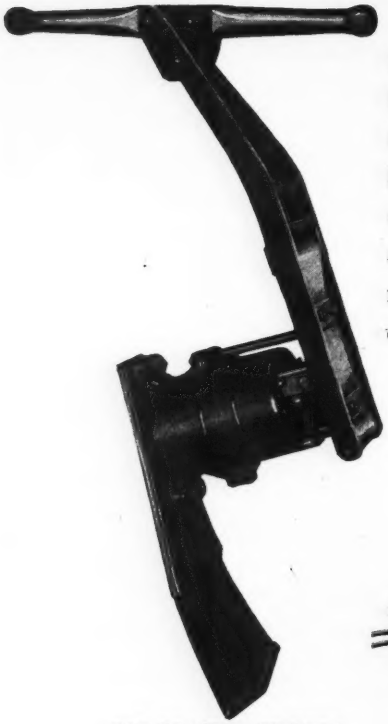
WHEELS AND AXLES

WORLD KNOW

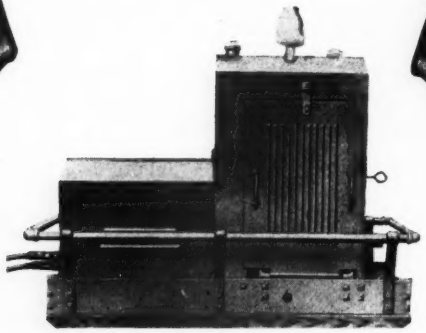
THE IMPROVED

JACKSON UNIVERSAL ELECTRIC TIE TAMPER





Made up in 4, 8 and 12-tool outfits. Capacity from 2000 to 5000 feet per day in gravel and other light ballast; 700 to 1500 feet per day in rock or slag. Cost of operation about 6% per year, maintenance about 2%. Power units exceptionally portable.



FOR GRAVEL, CINDERS, ETC.

SEVERAL SIZES OF POWER UNITS

FOR ROCK AND SLAG

ELECTRIC TAMPER & EQUIPMENT CO.

80 E. Jackson Blvd. Chicago, Ill.

THE CRAWLER CRANE for GREATER YARD CAPACITY

Here is economy in the loading yard

EXPORT shipments of boxed motor cars at General Motors Oldsmobile plant must be made with speed as well as economy. During the past six months more than 5000 boxed automobiles have been loaded by their Northwest crawler crane.

And in addition the crane is used to shift freight cars on the shipping sidings eliminating delays and switching engines.

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline and electric powered cranes, shovels and draglines.

1701 Steger Bldg. 28 East Jackson Blvd. Chicago, Ill.

NORTHWEST

CRANES · SHOVELS CONVERTIBLE and DRAGLINES

Gasoline and Electric

1/2 3/4 1 YD. 1 1/4

REM1-Gray

This little Crane will save MONEY every day this New Year

The versatile little Buckeye Utility Crane will do the heavy lifting of an entire gang, reducing the number of men required for construction or maintenance to only those actually needed for other operations.

It easily handles full length rails, frogs, switches, etc. It is highly efficient and economical for handling ballast or construction materials, or for a large variety of small excavation work, using a clamshell, dragline or orangepeel bucket, within its capacity.

Full revolving, it works advantageously in any direction. The heavy duty, medium speed motor provides ample power for ordinary needs, with a reserve for emergency requirements.

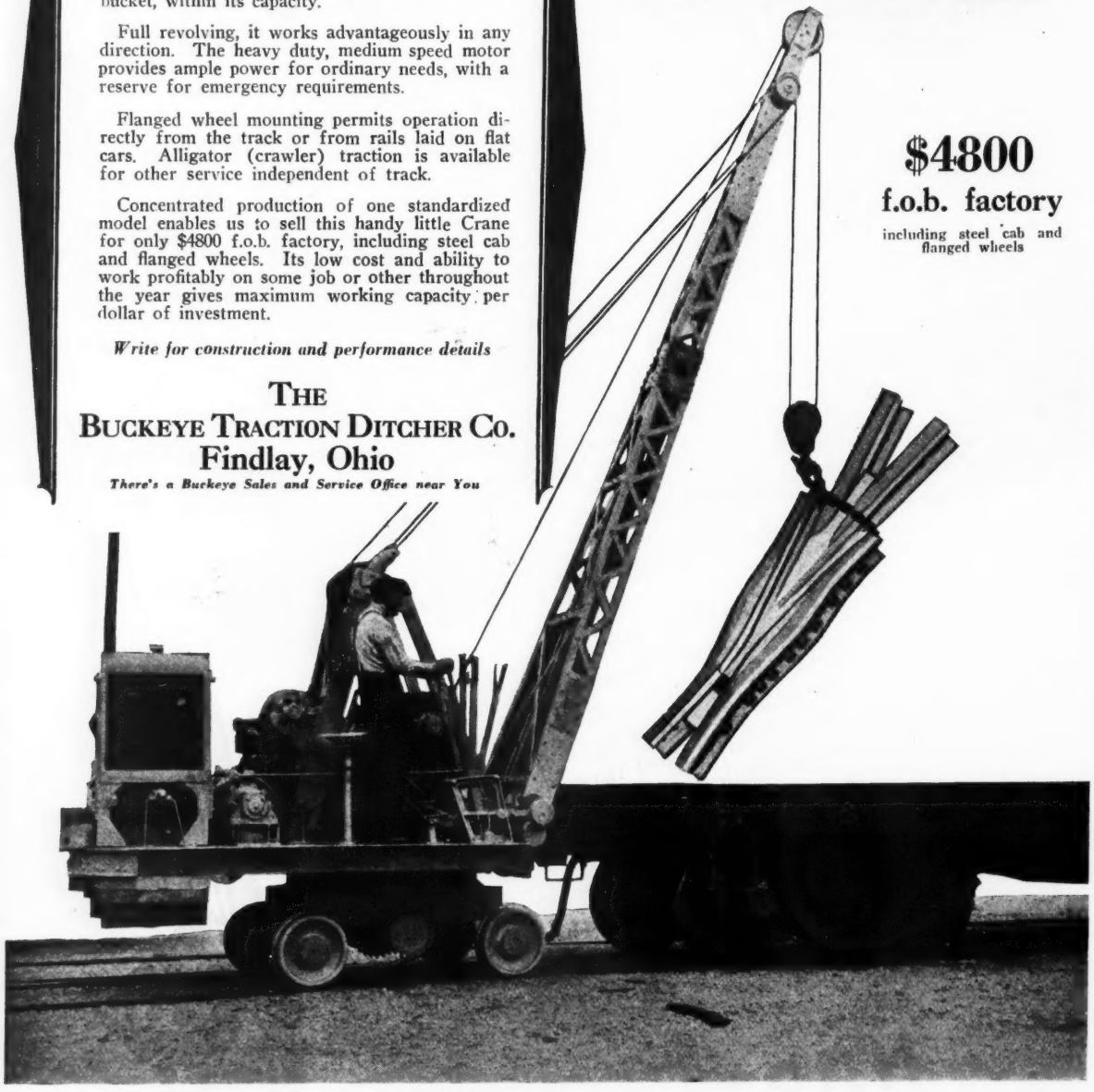
Flanged wheel mounting permits operation directly from the track or from rails laid on flat cars. Alligator (crawler) traction is available for other service independent of track.

Concentrated production of one standardized model enables us to sell this handy little Crane for only $4800 f.o.b. factory, including steel cab and flanged wheels. Its low cost and ability to work profitably on some job or other throughout the year gives maximum working capacity per dollar of investment.

Write for construction and performance details

THE BUCKEYE TRACTION DITCHER CO.
Findlay, Ohio
There's a Buckeye Sales and Service Office near You

$4800
f.o.b. factory
including steel cab and flanged wheels



for over thirty years
Buckeye

35 million plumbing fixtures

In a little more than a quarter century, public acceptance for "Standard" Plumbing Fixtures has enabled and required the stupendous production of *more than 35 million individual units.*

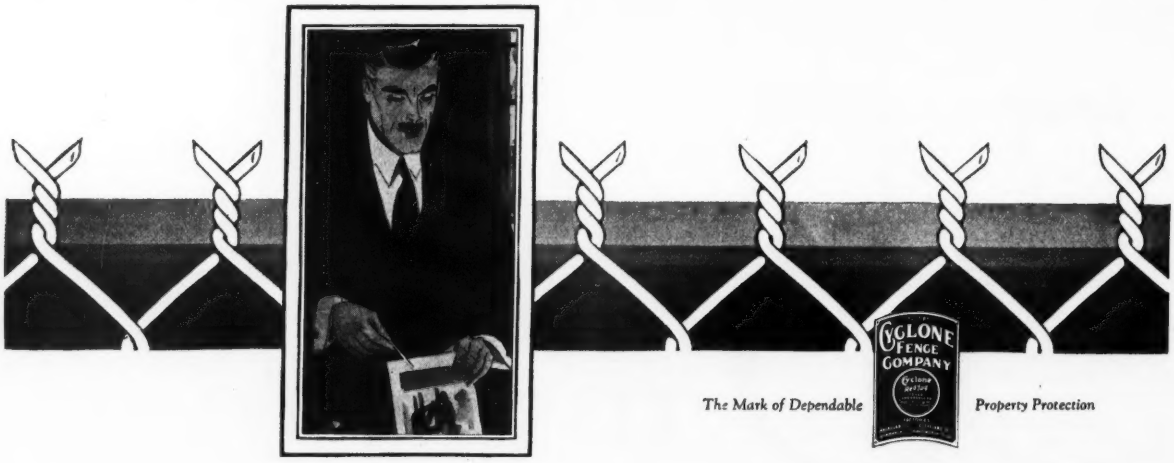
Of itself remarkable, this achievement acquires added significance from the fact that throughout its entire lifetime the name "Standard" has been inseparably and indisputably linked with *quality.*

That it should be increasingly called upon by the railroads of the country to equip their cars as it has equipped some of their largest and most prominent buildings is merely a natural development in line with a modern trend.

And the *complete line* of railway plumbing fixtures which "Standard" manufactures—including a wide selection of brass goods—imposes not the least restriction on appropriation or policy. Inquiry for catalog is invited.

Standard Sanitary Mfg. Co.
Railroad Fixture Department
Pittsburgh

"Standard" PLUMBING FIXTURES



The Mark of Dependable *Property Protection*

A Cyclone Representative Can Give You Real Fence Facts

Call Him In and Make a Careful Study of Fence Values!

HOW much should a good fence cost for your property? Which fence will prove the most economical on the only sound basis of per-year cost?

These questions are inevitable in the purchase of fence. Are you prepared to answer them? Do you know why one fence is better than another — why one gives many years of service while another is short-lived?

Call a Cyclone Fence representative! Lay your fencing problems before him. Consult him on fence engineering practice, methods of installation, latest fence improvements, manufacturing operations, quality of materials used, types of fence for your purpose, etc. Cyclone representatives are fence specialists — trained to know fence by working in Cyclone plants, studying fence application in the field, and actually erecting fence. In addition to this training is well-rounded experience which has developed resourcefulness and mature judgment on every type of fencing problem.

Consultation with a Cyclone representative saves time of busy executives who wish to investigate fencing. It enables them to get a panoramic picture of fence — complete information from a single source. This is part of Cyclone Service—rendered by the most complete fence-service organization in the world.

Call a Cyclone representative. Then you will be in a position to make comparisons of true fence values and decide for yourself which fence is the most economical to buy. Write, phone or wire nearest offices and have a Cyclone representative call, without obligation.

Cyclone Fence

REG. U.S. PAT. OFF.

Fencing for residences, estates, schools, playgrounds, factories, property of all kinds

CYCLONE FENCE COMPANY *Main Offices:* Waukegan, Ill.
Subsidiary of U. S. Steel Corp.

Works and Offices: North Chicago, Ill., Greensburg, Ind., Cleveland, Ohio, Newark, N. J., Fort Worth, Texas, Tecumseh, Mich., Oakland, Calif., Portland, Ore.

Direct Factory Branches in All Principal Cities

Pacific Coast Division: Standard Fence Company, Oakland, Los Angeles and San Francisco, Calif., Portland, Oregon, and Seattle, Washington

© C. F. Co., 1928

BALANCED DESIGN

Why do your shoes have soles?

Shoes are soled because the bottom gets the heaviest wear—it is a matter of balanced design.

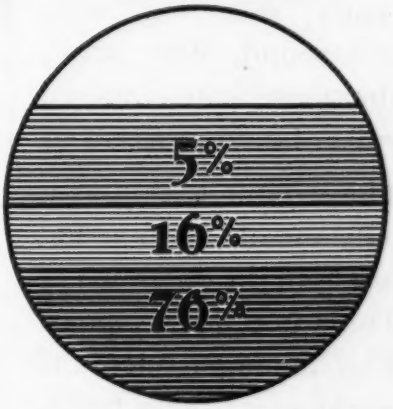
Investigation of thousands of culverts has proved the bottom of the culvert is subject to Nature's greatest destructive force—erosion.

Now Armco Culverts provide protection against this greatest cause of culvert failure . . . literally, the culvert is paved where the wear is hardest.

Get all the facts about the balanced design of Armco Paved Invert Culverts. Our Bulletin H 33 mailed on request.

ARMCO CULVERT MANUFACTURERS ASSOCIATION
MIDDLETOWN, OHIO

Thousands Inspected tell you this



½ to ¾ of the culvert affected by erosion in 5%*
⅓ to ½ affected by erosion in 16%*
The bottom third or less affected by erosion in 76%*

The conclusion—pave the invert and save the culvert.

* This data was obtained from investigation of several thousand culverts in actual service. The culverts investigated include all types and materials

ARMCO PAVED INVERT CULVERTS

© 1929, A. C. M. A.

Paved where the wear comes

THE WOOD ETERNAL

A hundred-year test of wood!

WOODEN water mains — moisture attacking from within, rot gnawing from without! What could better test the durability of lumber?

In 1793, New Orleans laid logs of Tidewater Red Cypress for its water supply. When dug up recently, these logs were still sound, still useful, after more than a hundred years of hard service.

Although laid in 1793, and put to such a severe test of its durability, this water main was in fine shape when dug up recently.

This striking testimony is only one of the thousand proofs of the durability of Tidewater Red Cypress. This lumber is used the world over in ship building. Millions of railroad ties are made of it. Many houses built of it are over two centuries old, and the country is still too young to know how long a cypress structure can endure.

When you order this Wood Eternal, be sure to specify "heart grade Tidewater Red Cypress" —for such durability is found only in "coastal type" red cypress.

Complete information will gladly be sent on request. Southern Cypress Manufacturers' Association, Department RE1, Jacksonville, Florida.

Tidewater Red Cypress is especially adapted for:

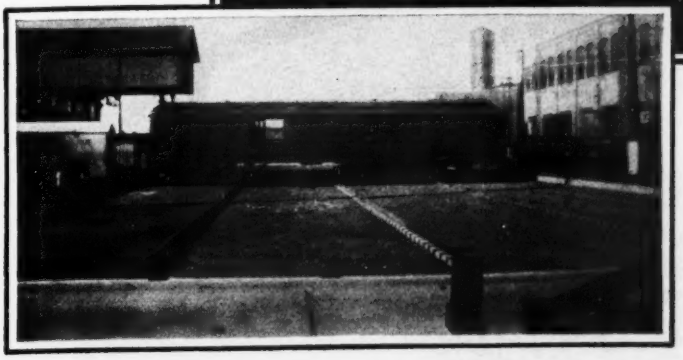
Passenger station construction
Freight sheds and warehouses
Platform construction
Conduits for signalling systems
Water tanks—box cars—cattle cars—refrigerator cars
Fencing

In short, any use where long life and absolute freedom from repairs are essential.

Specify TIDEWATER RED CYPRESS

THE WOOD ETERNAL

The Cotton Belt Railroad Couldn't Afford to Tie Up This Busy Transfer Table



~so they used QUIKARD CEMENT~

Showing use of Quikard Cement in transfer table at Cotton Belt Shops, Pine Bluff, Arkansas.

CONCRETE foundations placed Sunday. Rails bolted into place Monday. Transfer table again in use Tuesday carrying heavy locomotives and coaches from one track to another.

That's the rapid service rendered the Cotton Belt R. R. by Quikard Cement in replacing worn-out foundations under their busy transfer table at Pine Bluff, Ark. —the result of Quikard's 28-day standard strength in 24 hours.

No longer need you tie up operations for extended periods—provided you use Quikard. As a true Portland Cement, it sets normally, requires no admixtures. It takes 10 to 15% less mixing water to obtain desired workability, eliminating cracking or checking. It produces a light-colored, uniform, watertight concrete that requires curing only 24 hours!

Use Quikard in turntable bases, foundations, crossings, pavements, platforms, bridges, culverts—and place them in service within 24 hours. No delays. No idle labor. No blockades. Construction gangs can move along two to three weeks sooner!

Learn More

about this remarkable cement

Let us tell you more about the time and money-saving ability of this highly-refined, quick-hardening cement. Packed in 5-ply paper bags, Quikard may be safely stored for emergency use. Shipped in mixed cars with Ash Grove Portland Cement. Don't wait until you need Quikard — write today so you'll have it when the emergency arises.

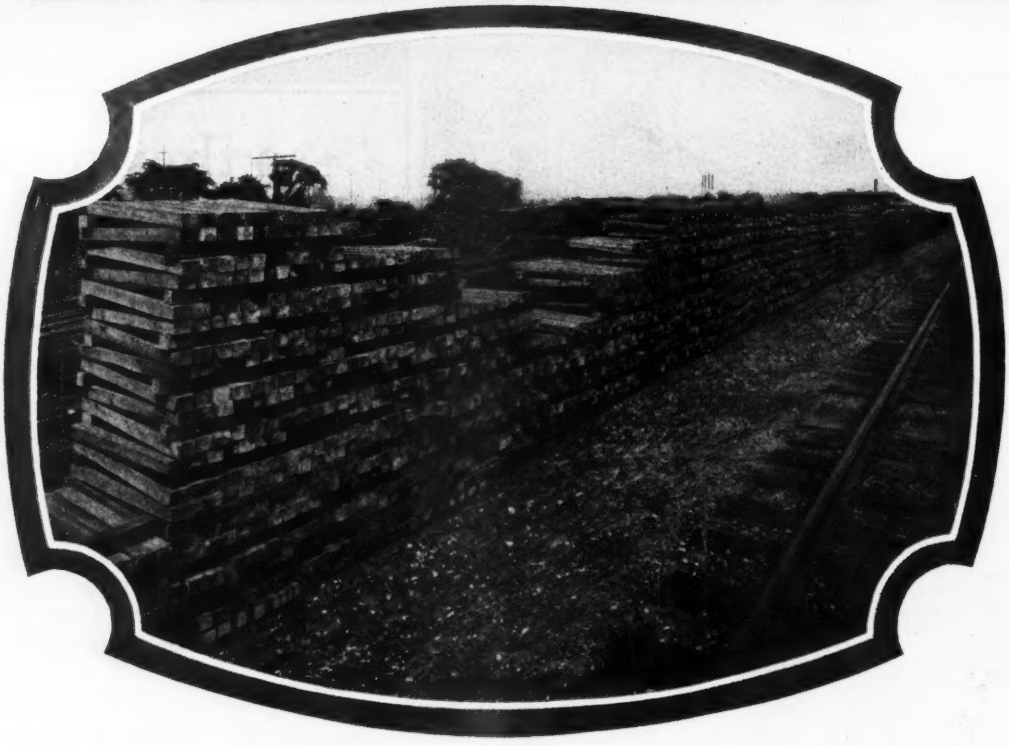
Produced Only by
ASH GROVE LIME & PORTLAND CEMENT CO.
Founded in 1882
634 Grand Avenue Temple, KANSAS CITY, MO.

QUIKARD CEMENT

(34)

A *TRUE* PORTLAND CEMENT *for RAPID* CONSTRUCTION

KREOLITE



LIFE OF TREATED TIMBER DEPENDS UPON CHARACTER OF PRESERVATIVE USED

In order to insure the purchaser of a pure and uniform product, *we distill all of our own creosote oil.*

By our own method of distillation, it is possible to insure to the purchaser a uniform, pure Creosote Oil of any grade desired.

We have treated hundreds of millions of feet of timber in the past seventeen years without a single instance of decay.

Enormous stocks of Railroad Cross Ties, Switch Ties, Structural Timbers and Piling, in all sizes, in Solid Oak or Pine, properly sticked, stacked, and air seasoned before treatment, available for prompt shipment from Toledo, Ohio, or our Midland Creosoting Company plant at Granite City, Ill. (East St. Louis).

We specialize in framing timbers to your plan before treatment.

Quick shipment on short notice.

THE JENNISON-WRIGHT COMPANY, TOLEDO, OHIO

Branches in All Large Cities

R.R. TIES

RAILS & SPLICES

Into every rail and splice bar manufactured by this company the name "Carnegie" is rolled. This name on steel represents years of conscientious effort to give steel users better products—it represents control of manufacture from the mining of the ore to finished product—it represents unlimited facilities for proper manufacture—it represents the work of experienced metallurgists—the pride of skilled workmen in their craft. It represents a friendly spirit of service and cooperation. Carnegie Rails and high carbon, oil quenched Splice Bars bear this name—our guarantee of your satisfaction. Whether your order be small or large, you may expect the same prompt and efficient service.

Let us quote on your next requirements

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION

CARNEGIE BUILDING—PITTSBURGH, PA.

1943

Q AND C

Real Economy

Eliminating Derailments *at your* Switches

THE reputation of the Q & C Switch Point Guard for eliminating derailments and extending the life of the switch point is based on certain definite features of design and construction found only in the Q & C Switch Point Guard.

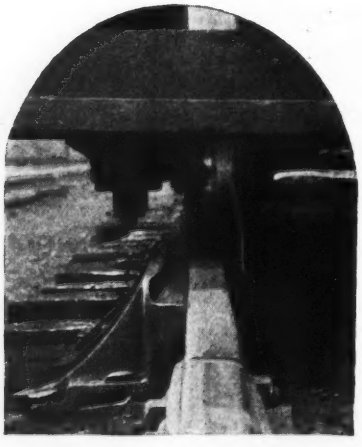
The long angle of deflection receives the wheels without causing a shock to the equipment and guides them firmly past the switch point during either a facing point or a trailing movement. This makes derailments impossible and extends the life of the switch point many times.

The Q & C Switch Point Guard is a simple one piece casting made of manganese steel. It is applied on the outside of the running rail, assuring safety. There is practically no maintenance necessary.

We are prepared to furnish a design that will fit your standard switch plates and tie spacing.

If you want true protection at your switch point—requisition Q & C Switch Point Guard. Recommended for slow speed only.

Blue prints and prices gladly furnished.



View showing the position of the wheel after having been guided by the switch point guard, making it impossible for it to touch the switch point.

THE Q & C COMPANY

90 West Street, New York

Peoples Gas Building - - Chicago

R'w'y Exchange Building - St. Louis

The New CP Tie Tamper

Faster – Lighter Easier to Handle

TIE tamping has been simplified, speeded up and reduced in cost by the new CP Tie Tamper. SIMPLIFIED because the operator stands in an easy, natural position and complete control is under the palm of one hand. SPEEDED UP because the CP Tie Tamper is faster, lighter and easier to handle. REDUCED IN COST because the operator can do more work with less fatigue than with any other tool as the hammer is fully cushioned on both ends and practically vibrationless; an Automatic Throttle Valve shuts off the power when the tamper is lifted from one position to another, thus saving air and wear and tear on the tool which appreciably lowers maintenance.

The New CP Tie Tamper is fully illustrated and described in folder 1646, sent on request.

Chicago Pneumatic Tool Co.

Railroad Department

6 East 44th St. New York | 1004 Mutual Bldg. Richmond, Va. | 310 S. Michigan Ave. Chicago

P-287

AMERICAN
AURORA, ILL.

AMERICAN DOUBLE SUCTION CENTRIFUGAL PUMP

with Anti-Friction Bearings

Branch Offices:

Chicago, Ill.
1615 First Nat. Bank Bldg.
New York, N. Y.
Room 523—165 Broadway
Los Angeles, Calif.
420 East Third Street

District Sales Agencies:

Boston, Mass.	St. Louis, Mo.
Detroit, Mich.	Tulsa, Okla.
Dallas, Tex.	Denver, Colo.
Omaha, Neb.	Birmingham, Ala.
Atlanta, Ga.	Joplin, Mo.
Charlotte, N. C.	El Paso, Texas
Pittsburgh, Pa.	Kansas City, Mo.
Roswell, N. M.	St. Paul, Minn.
Philadelphia, Pa.	Portales, N. Mex.
Salt Lake City, Utah	
San Francisco, Calif.	
Vancouver, B. C., Can.	

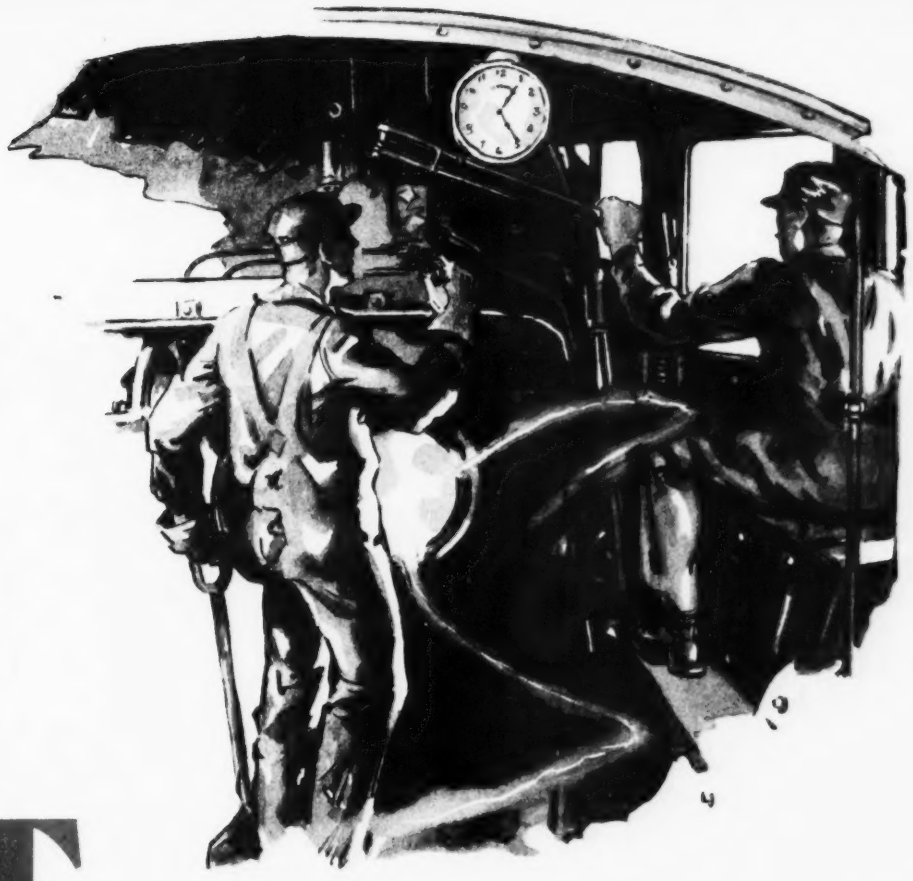
To meet the requirements of the pump buying public, the American Well Works announces the development of a high speed, double suction, centrifugal pump, suitable for motor speeds up to 3600 R. P. M. The rugged and inherent qualities the engineer has a right to expect of an American Well Works pump has been consistently maintained in both design and manufacture. The demand for anti-friction bearings has been met in this new line of pumps. They may be furnished either with sleeve or ball bearings.

The ratings on these pumps are conservative and are based on exhaustive tests on carefully checked and calibrated instruments. The attainment of the high efficiencies has not been made at a sacrifice of either simplicity or through skimping of shaft sizes or shortening of packing boxes. Disc friction losses are cut to the minimum through the use of a small diameter impeller. Precision workmanship and shop control guarantee the consistency of rated efficiencies.

Data on the "American" 1½ inch, double suction, centrifugal pump with, or without, anti-friction bearings is available for the asking. Performance curves are available to engineers.

THE AMERICAN WELL WORKS

General Offices AURORA, ILLINOIS *and Factory*



They don't run railroads by alarm clocks!

Alarm clocks are wonderful call-boys but they are not quite the thing a hoghead is willing to check landmarks against.

Likewise a cheap motor car will travel over the rails—at times—but it's not a car you can depend on when the whole railroad is fighting to keep a tough spot open.

And in the long run you pay the cost of a "Sheffield" and more—when you buy a cheaper car. The small extra investment in a "Sheffield" yields big returns in lower maintenance and dependable service.

TIMKEN BEARING EQUIPPED

FAIRBANKS-MORSE

MOTOR CARS

FAIRBANKS-MORSE MOTOR CARS

The "Sheffield" policy!

The first engine driven car to appear on American rails was a "Sheffield." That first car in 1896 was the product of a policy which still guides the Sheffield organization. That policy has made "Sheffield" the leading manufacturer of railway motor cars and trailers—and Sheffield relies on that policy to maintain Sheffield future leadership. Briefly the Sheffield policy is as follows:

1

Sheffield cars shall be the lowest *cost* cars on the market. Therefore, they cannot always be the lowest *priced.*

2

Sheffield cars shall be manufactured with every economy known to modern production methods. But only legitimate economies which do not impair efficiency and dependability shall be employed.

3

If a car the equal of a "Sheffield" is ever produced—*the Sheffield will be lower in price.*

This is the Sheffield policy. America's most completely equipped plant for the manufacture of railway motor cars is back of it.

FAIRBANKS, MORSE & CO., *Chicago*

Manufacturers of railway motor cars; hand cars; push cars; velocipedes; standpipes for water and oil; tank fixtures; oil engines; electric motors; steam, power and centrifugal pumps; scales; complete coaling stations

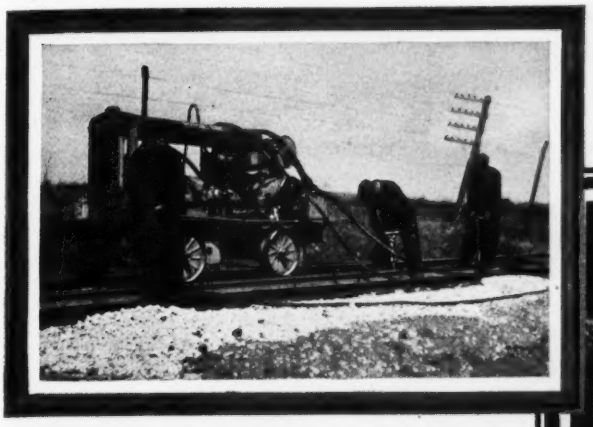
FAIRBANKS-MORSE

MOTOR CARS

TIMKEN BEARING EQUIPPED

First on the rails—and still first

FAIRBANKS-MORSE MOTOR CARS



Driving spikes with CC-250 Spike Drivers operated from I-R Tie Tamper Compressor.

Saving time and labor all year 'round

Ingersoll-Rand Tie Tamper Compressors and tools make savings in time and labor every month of the year. Their use is not confined to any particular job or seasonal period, but extends the year 'round—on rail laying, tie tamping, bridge and building work, and a wide variety of other operations.

R-1753

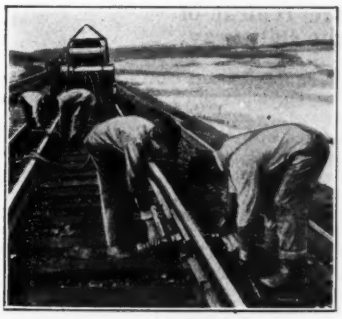
CC-250 Spike Driver

INGERSOLL-RAND COMPANY

11 Broadway - - - - - - New York City

Offices in principal cities the world over

For Canada Refer—Canadian Ingersoll-Rand Co., Limited, 10 Phillips Square, Montreal, Quebec



Rail Bolting

Spike Pulling

Tie Tamping

260-TT

Ingersoll-Rand

"Quality leaves its imprint"

There's an R-W way for every doorway

There is no doorway problem, large or small, that R-W equipment will not solve. The installations described below are typical of the experience of thousands who use the R-W way—the right way:

Edward Wotton, Supt. of Equipment, Chicago Motor Coach Co., Chicago, says: "Large door openings are necessary in our garages to provide safety clearance for motor coaches. Our large West Side garage has two 40 ft. by 17 ft. openings. Door hangers for openings this size must be of proper design and construction or the great weight of the doors will soon put them out of commission.

"After experience with many other types of hangers, we have standardized on Richards-Wilcox Equipment, using ball-bearing trolleys of sufficient capacity to avoid overloading, because its absolute rigidity prevents misalignment and excessive wear.

"One 40 ft. by 17 ft. opening was equipped with a pair of sliding doors, weighing 4,500 lbs. each. These doors must be operated hundreds of times each day, as our buses are constantly leaving or returning.

"The other opening was fitted with 4-fold doors running on R-W No. 925 trolleys. Each door weighs 2,300 lbs.—or a total weight of 9,200 lbs.; yet with the R-W equipment these doors can be easily handled by one man.

"The old type of door was so hard to operate it often was not opened wide enough, and accidents resulted, after which the doors never would operate properly. Our R-W equipped doors are most satisfactory."

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides."

AURORA, ILLINOIS, U.S.A.

New York Boston Philadelphia Cleveland Cincinnati Indianapolis St. Louis New Orleans
Chicago Minneapolis Kansas City Los Angeles San Francisco Omaha Seattle Detroit

Montreal · RICHARDS-WILCOX CANADIAN CO., LTD., LONDON, ONT. · Winnipeg

(830)

DRIVING DOWN . . . .

maintenance of way costs

Here is a locomotive crane (*American*) that warrants your serious consideration—one that is built on two basic principles—to handle your maintenance of way work at a low cost and to give you more years of service.

Comparing an *American* with ordinary locomotive cranes on the market, you'll find only the American gives you such advantages as gib ring construction for fastening the revolving deck to the truck.

This type of construction costs a little more to build, but it eliminates "rocking" on the roller path. The locking of the revolving deck to the truck at the circumference of the roller path gives you greater stability when lifting. The leverage factor of safety on an *American* is 50% greater than it is on cranes using the king pin construction.

This feature alone means an annual saving of many dollars in upkeep costs and even greater savings from the elimination of costly delays.

In addition, the *American* gives you a roller path with 20 roller bearings; one horizontal, non-reversing engine that actuates all motions simultaneously; a fully enclosed automotive type shaft drive; larger and cooler running frictions.

No other locomotive crane on the market offers all these advantages. That's why so many railroads are turning to *American* Locomotive Cranes for driving down their maintenance of way and general material-handling costs.

AMERICAN HOIST & DERRICK COMPANY
89 South Robert Street, ST. PAUL, MINN.

Chicago Pittsburgh St. Louis Indianapolis
Seattle New York New Orleans San Francisco
Birmingham Detroit Los Angeles

makers of the famous
AMERICAN DITCHER

AMERICAN
HOIST & DERRICK CO.

A Kyrock Top Saves concrete roads

THESE pictures show Indiana State Highway No. 9 at Alexandria, Ind., before, during and after surfacing with Kyrock. The original construction of cement concrete, built by the County, was disintegrating under the traffic. The cost of maintenance was prohibitive. A Kyrock wearing surface, laid on intermediate course of bituminous macadam. 1927, by the Stone Construction Co., Richmond, Ind., saved the investment in the old base, stopped maintenance expense and restored the road to service—a better road.

Resurface old concrete before disintegration proceeds too far and avoid the extra cost of the intermediate course.

KENTUCKY ROCK ASPHALT COMPANY, LOUISVILLE, KY.
INCORPORATED

deLavaud is 25% stronger

than any other CAST IRON PIPE

and . . . here's the reason why

IT has long been known by chemists and engineers that the finer and less angular the graphite particles of any cast iron, the stronger will be the metal itself.

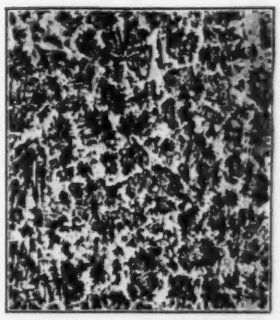
A direct comparison of the micrographs shown here will explain very clearly why deLavaud is mechanically superior to any other cast iron pipe.

The illustration at the left shows a cross-section of a piece of ordinary cast iron pipe magnified 100 times. Upon close examination we find that the continuity of the mass is broken up by extremely long flakes of coarse graphite.

Now observe the micrograph of the deLavaud Pipe shown at the right. Note the smallness of the graphite masses and the fine even texture of the metal. This density and the uniformity of grain structure give deLavaud pipe a tensile strength of more than 30,000 lbs. per square inch.

Indeed, exhaustive laboratory and factory tests have proved that deLavaud Cast Iron Pipe is 25% stronger than pipe cast by any other method.

Sand Cast Pipe. Micrograph showing center of wall cross-section. Magnification 100 times. Note the long flakes of brittle graphite.



Cross-Section of deLavaud Pipe at center of wall. Magnification 100 times. Observe the even grain and the finely divided condition of the graphite.

deLAVAUD CAST IRON PIPE

centrifugally cast by

United States Cast Iron Pipe and Foundry Company

General Offices:

Burlington, New Jersey

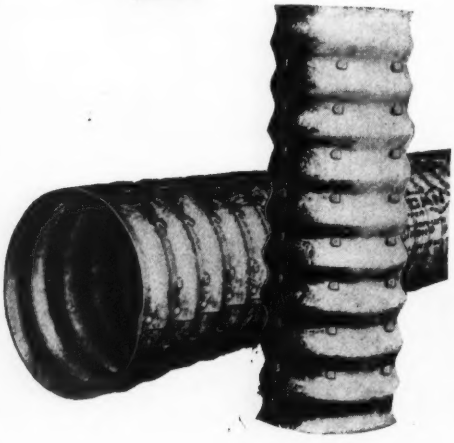
Philadelphia: 1421 Chestnut St.
Chicago: 122 So. Michigan Blvd.
Birmingham: 1st Ave. & 20th St.
Buffalo: 957 East Ferry Street
Cleveland: 1150 East 26th Street
New York: 71 Broadway
San Francisco: 3rd & Market Sts.

Los Angeles: 403 So. Hill St.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.
Seattle: 1st & Marion Sts.
Minneapolis: 6th Street & Hennepin Avenue

WATER Is A Great Road-bed Disturber Remove It Quickly With Sub-drains of

TONCAN COPPER MO-LYB-DEN-UM **IRON**

REG. U.S. PAT. OFF.
TONCAN
COPPER
Mo-lyb-den-um
IRON



WHEREVER water is allowed to collect in open cuts, tunnels, multiple track or track pans a job is brewing for the maintenance gang.

Remove subsurface water as quickly as you can and as economically as possible.

This means sub-drains of Toncan Iron. Due to the use of outward-tongued perforations which retard the entry of dirt, these drains have a higher drainage efficiency.

Their long life and economy is assured by their corrugated construction and the higher corrosion resistance of Toncan Iron.

Toncan Iron has the natural corrosion-resistance of iron further fortified by the addition of copper and molybdenum. Drains of Toncan Iron are sure to be more permanent.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION, *Massillon, Ohio*

The Canton Culvert & Silo Co. Canton, Ohio
The Berger Mfg. Co., of Mass. Boston, Mass.
The Berger Manufacturing Co. Philadelphia, Pa.
The Berger Manufacturing Co. Roanoke, Virginia
The Berger Manufacturing Co. Jacksonville, Florida
The Berger Manufacturing Co. Dallas, Texas
The Berger Manufacturing Co. Minneapolis, Minn.
The Berger Manufacturing Co. (Export), New York, N. Y.
Tri-State Culvert Mfg. Co. Memphis, Tenn.
Tri-State Culvert Mfg. Co. Atlanta, Ga.
The Firman L. Carswell Mfg. Co. Kansas City, Kan.
Wheat Culvert Co., Inc. Newport, Ky.
Beall Pipe & Tank Corp. Portland, Ore.
Superior Culvert & Flume Mfg. Co. Los Angeles, Calif.
Superior Culvert & Flume Mfg. Co. Oakland, Calif.
The Pedlar People Limited, Oshawa, Ontario, Canada

TONCAN COPPER MO-LYB-DEN-UM **IRON**

Industrial Brownhoist Cranes—First Choice of the Nation's Railroads

On the Nation's railroads, where locomotive cranes have come to be almost as indispensable as the locomotive itself, you will find far more Industrial Brownhoists than any other make. Two of the larger roads alone have purchased over five hundred of these cranes and the total number in this industry is many times that figure.

The number of cranes owned by railroads has steadily increased, as new uses are constantly being found for this most flexible of all handling units. Most of these uses are applicable to many lines of industry and millions of dollars are being saved each year through the use of Industrial Brownhoist handling equipment. A like amount could be saved by plants that are not benefiting by the economies of crane equipment.

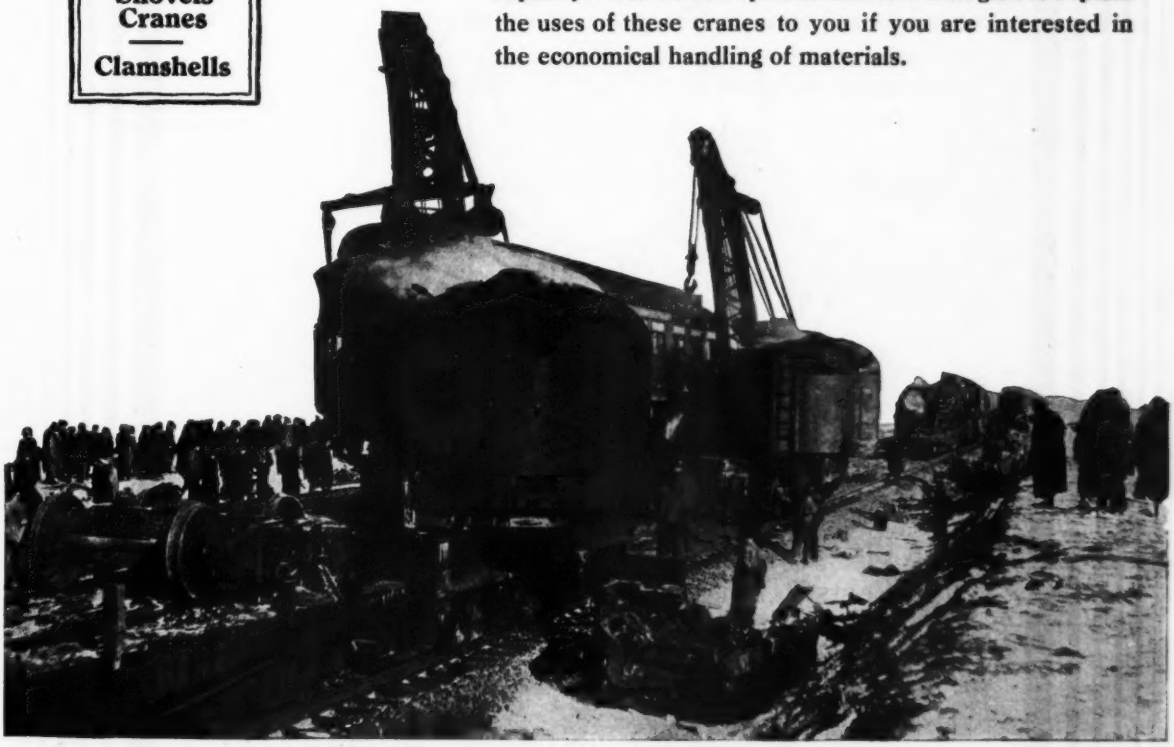
Industrial Brownhoist builds cranes of many types and sizes; from the smallest that is serviceable to the big machines of 200 tons capacity. One of our representatives will be glad to explain the uses of these cranes to you if you are interested in the economical handling of materials.

INDUSTRIAL IB BROWNHOIST

Locomotive Cranes 6 to 200 Tons Capacity

Crawler Shovels Cranes

Clamshells



Industrial Brownhoist Corporation

General Offices: Cleveland, Ohio.

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco.

INDUSTRIAL BROWNHOIST

JORDAN
Railway Track Oiler

Ask for latest circular on "Use of Oil in the Reduction of Railway Maintenance Costs." This illustrates and describes the work of the Jordan Track Oiler and Spraying Machine.

Now successfully operating on many leading trunk line railways.

REDUCE LABOR COSTS IN 1929

A Four Man Rail Gang Is Sufficient
If You Use the

VERONA RATCHET ACTION TRACK WRENCH

(D. C. BETTISON PATENT)

This Verona No. 555 Wrench Offers

RAPID ACTION
DURABLE SERVICE
EASY OPERATION

Made of high grade tool steel, drop forged—carefully heat treated.

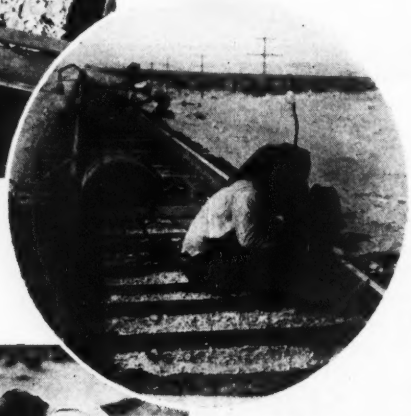
Furnished in standard lengths for any *square* nut.

VERONA TOOL WORKS
Pittsburgh, Pa.

RAIL END RECLAMATION

Setting Power Plant off the Track

Chipping off Laminated Metal Before Welding



Welder at work half-mile from Power Plant

Above—Grinding joint to a true surface

Right—Camphering joint after surface grinding

"TELEWELD COMPLETE SERVICE" was successfully employed on thirteen prominent railroads of the U. S. during 1928.

These roads represent a combined road mileage of 62,200 miles.

This is conclusive evidence of the value of "TELEWELD COMPLETE SERVICE."

If you are interested in rail end reclamation, you will be interested in the "TELEWELD electric PROCESS."

Rail surveys made without obligation or expense.

San Francisco
952 Howard Street

Salt Lake City
Continental Bank Bldg.

ELECTRIC RAIL WELD SERVICE CORP.

Denver
2101 Blake Street

Spokane
Old Nat. Bank Bldg

RAILWAY EXCHANGE BUILDING, CHICAGO

Specify these ties . . *then cut your maintenance budgets for 25 years*

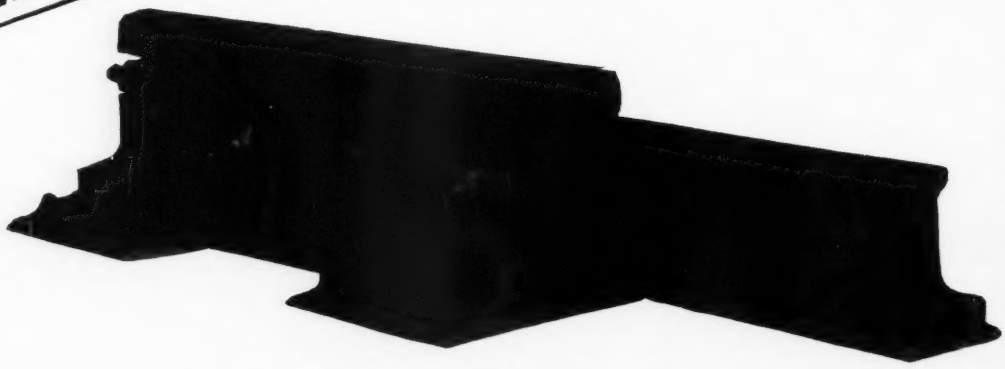
SPECIFY these Prettyman Preserved Ties of sound Southern Yellow Pine for all 1929 installations. Then forget maintenance and replacement costs, insofar as these ties are concerned, until 1954 or thereabouts. Forget all about expensive replacements every three to five years . . . the cost of new ties to take the place of decayed ones . . . the labor cost of removing old ties and placing the new. You can do it with Prettyman Preserved Ties, and their low initial cost will amaze you.

Here is the reason—it is no secret. Prettyman Preservation places at your disposal the economy made possible through the use of Southern Yellow Pine, with its substantially lower cost, great natural strength, toughness, elasticity and resiliency. Impregnation to the heartwood with highest grade creosote oil or creosote-coal tar solution (depending upon your specifications) preserves intact these natural qualities for 15 to 25 years, immune to all known causes of decay. The thick, toxic sheathing of thoroughly impregnated sapwood effectively resists the attacks of termites (white ants), fungous growth and the deleterious effects of contact with certain types of soils.

Prettyman Preservation eliminates the only obstacle to general use of Southern Yellow Pine as a tie wood—its susceptibility to decay. It makes available to you the greatest number of years of tie service per dollar of cost. Write today for quotations.

J. F. Prettyman & Sons
Wood Preserving Plant
Charleston, S. C.

KEEPING PACE WITH PROGRESS



Another Kind of Super-Superiority

130 LB. **New Rail** LAID IN **April, 1928**
ON 1° 45″ COMPOUND CURVE
WITH VERY HEAVY TONNAGE RUNNING BOTH WAYS

Rail Joints

HEADFREE CONTINUOUS	HEAVY-100%-HEAD ANGLE BARS
20 5½ Year **Old Joints** in middle of curve	10 **New Joints** at each end of the stretch of **Old Joints**

Late October, 1928
Track worked and raised 3″

Less Than One Month Later
(Readings taken Nov. 16, 1928)

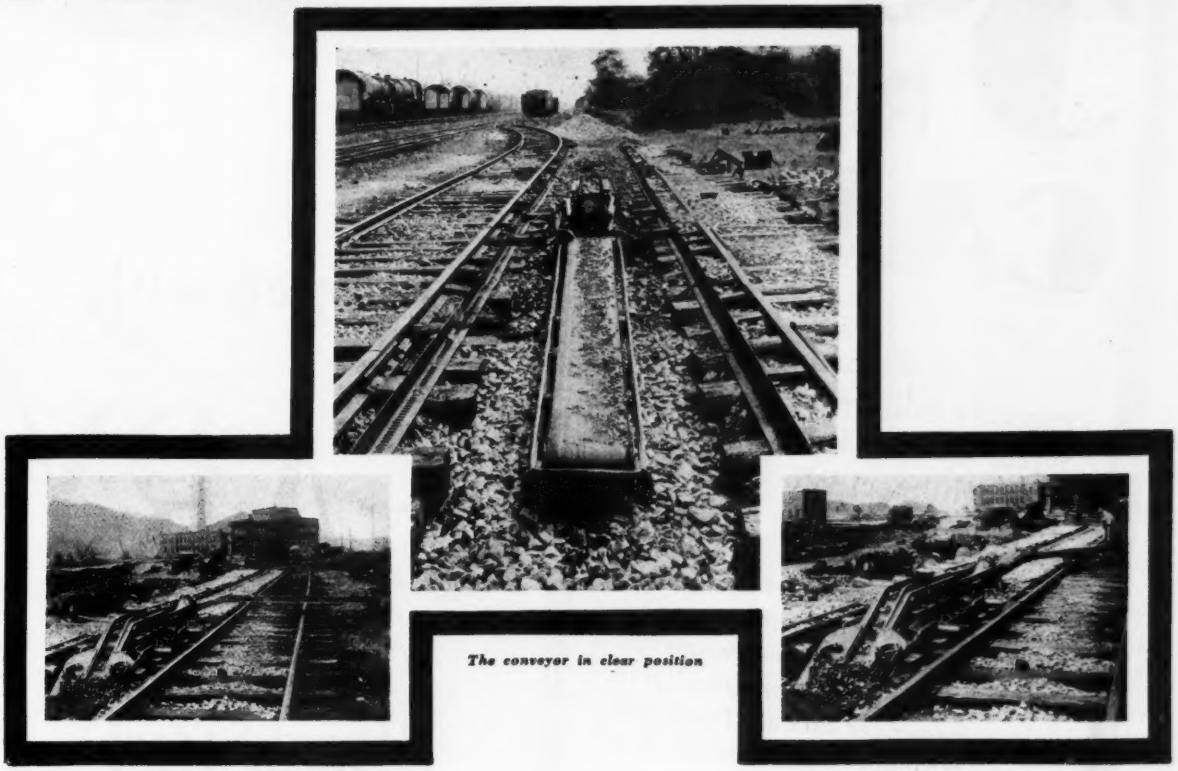
6 Yr. Old Headfree Continuous
— Rail-ends **High** —

7 Mo. Old Angle Bars
— Rail-ends **Low** —

THE RAIL JOINT COMPANY

165 Broadway — New York City
OR ANY ONE OF OUR DISTRICT OFFICES

McWILLIAMS
BALLAST CLEANING DEVICES



Conveyor in operating position

The conveyor in clear position

Conveyor being swung to clear

A NEW SWING CONVEYOR

—has just been developed and perfected by this company for use with the McWilliams Mole.

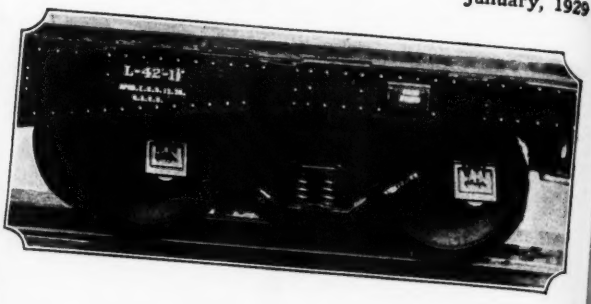
This conveyor will deliver the dirt to either side of the track when desired and swing to the clear. It is no longer necessary for laborers to carry the dirt from the rear of the "Mole," and the amount of labor required to operate the "Mole" is therefore reduced at least fifty per cent.

Write for the facts

RAILWAY MAINTENANCE CORPORATION

PITTSBURGH, PA.

500 NEW CARS



. . . . . Five hundred cars, recently built, were equipped with Gary Light Weight Wrought Steel Wheels. . . . As a result the owners receive—

1 . . . . The *safety* of a homogeneous structure . . . safety that is self-evident when it is realized that practically all passenger cars are fitted with wrought steel wheels.

2 . . . . The *economy* of long, uninterrupted and care-free service . . . *low cost per mile,* the true standard of wheel value!

Our wheel engineers will gladly give you full information on this important development without cost or obligation.

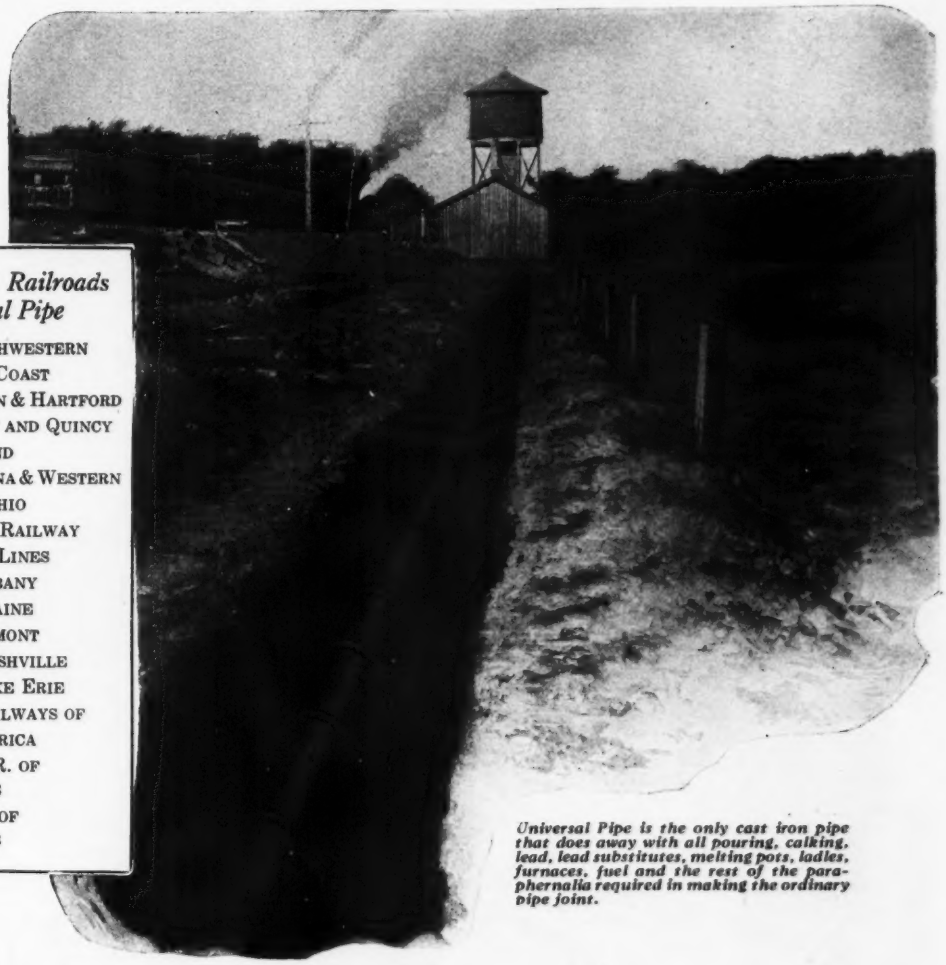
equipped with

GARY

Light Weight Wrought Steel WHEELS

Illinois Steel Company
Subsidiary United States Steel Corporation
General Offices:
208 South La Salle Street
Chicago, Illinois

The advantages of wrought steel applied to freight car service.



Universal Pipe is the only cast iron pipe that does away with all pouring, calking, lead, lead substitutes, melting pots, ladles, furnaces, fuel and the rest of the paraphernalia required in making the ordinary pipe joint.

A Partial List of Railroads using Universal Pipe

CHICAGO AND NORTHWESTERN
FLORIDA EAST COAST
NEW YORK, NEW HAVEN & HARTFORD
CHICAGO, BURLINGTON AND QUINCY
LONG ISLAND
DELAWARE, LACKAWANNA & WESTERN
MOBILE & OHIO
CANADIAN PACIFIC RAILWAY
PENNSYLVANIA LINES
BOSTON & ALBANY
BOSTON & MAINE
CENTRAL VERMONT
LOUISVILLE & NASHVILLE
WHEELING & LAKE ERIE
INTERNATIONAL RAILWAYS OF CENTRAL AMERICA
TRUXILLO R. R. OF HONDURAS
TELA R. R. OF HONDURAS

Savings all along the line . . .

Experienced labor unnecessary—Wrenches the only tools

RAILROADS with an eye to highest efficiency prefer Universal Cast Iron Pipe for water supply, fire protection and other service where freedom from leakage is essential.

There is nothing to deteriorate, nothing to work loose in the Universal Pipe joint. All jointing materials and jointing equipment eliminated. Experienced labor unnecessary.

The hub and spigot ends, machined at slightly different tapers, are drawn into direct contact, forming a flexible joint that amply provides for expansion and contraction, vibration and uneven ground settlement. Curves laid with standard 6-foot lengths.

Universal Cast Iron Pipe is in great favor the country over because of its labor-saving simplicity and unfailing dependability. Every joint as permanently tight as the wall of the pipe itself. Let our nearest office show you how much easier, quicker and safer Universal Pipe really is.

UNIVERSAL CAST IRON PIPE

No bell holes to dig: No joints to calk

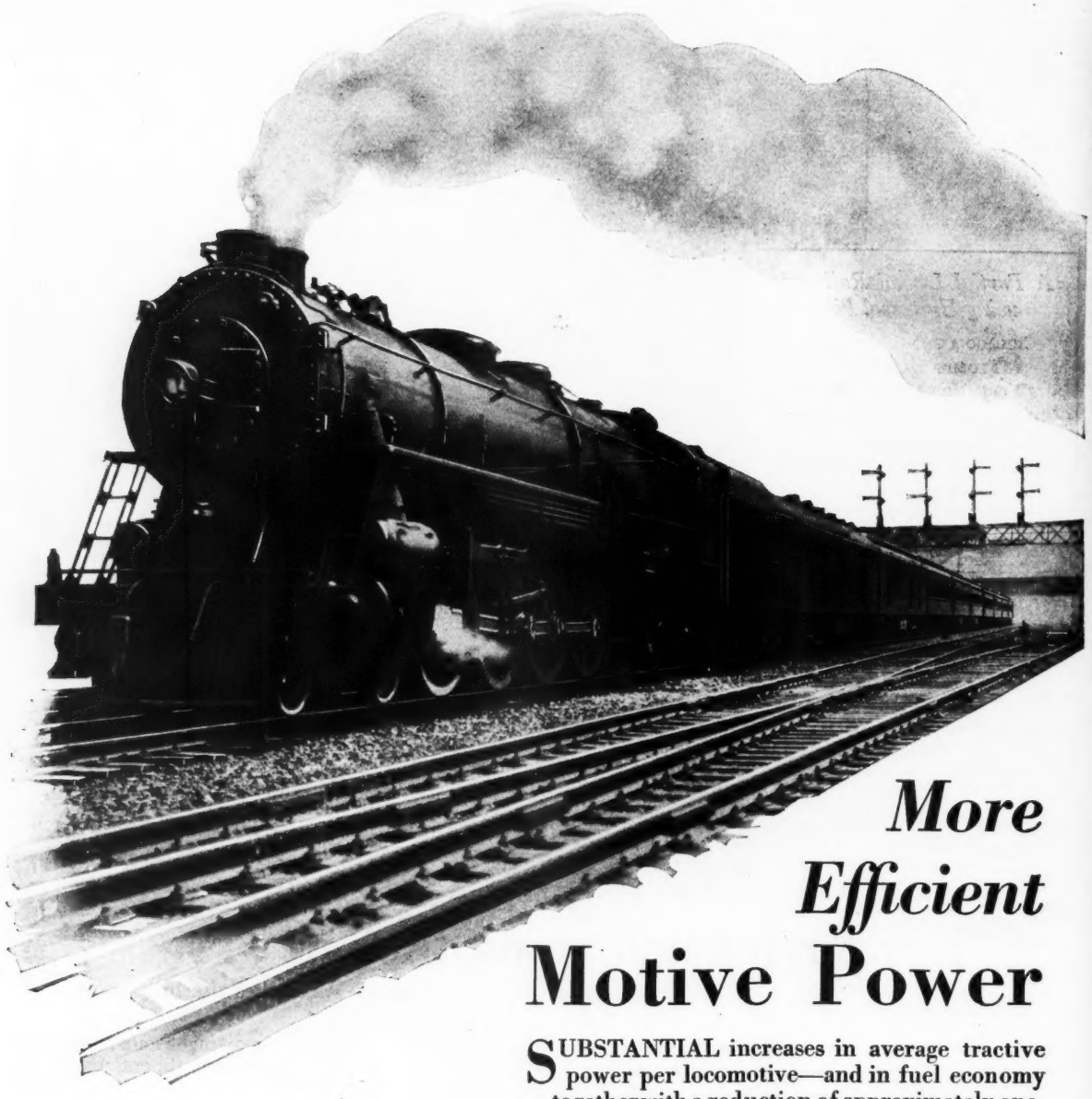
THE CENTRAL FOUNDRY COMPANY

Subsidiary of The Universal Pipe and Radiator Company

Graybar Building, 420 Lexington Avenue

Chicago Birmingham New York Dallas San Francisco

R-4



More Efficient Motive Power

SUBSTANTIAL increases in average tractive power per locomotive—and in fuel economy—together with a reduction of approximately one-third in the number of "bad-order" locomotives, are marked accomplishments in the new era of Locomotive Power. From 1920 to 1927 average tractive effort increased 17 per cent. Fuel consumption per gross ton-mile fell 25 per cent, and the number of "bad-order" locomotives fell from 24.5 to 16.2 per cent.

The Oxweld Railroad Service Company, by supplying the oxwelding needs of a majority of the important railroads of the country, is helping to maintain these high standards of modern locomotive power.

OXWELD RAILROAD SERVICE

THE OXWELD RAILROAD SERVICE CO.

Unit of Union Carbide UCC *and Carbon Corporation*

New York City: Carbide and Carbon Building

Chicago: Railway Exchange

MATERIALS and WORKMANSHIP To Stand Long Hard Service

WOODINGS tools are proving their durability every day in withstanding hard usage in track maintenance and construction work. They are made from the very best grades of steel obtainable by expert workmen. Details of forging, tempering and treatment are carefully executed to produce tools of extreme utility and durability. The picks, bars, chisels and sledges are beautifully finished and well balanced—the kind the trackmen like to use—and which produce results more quickly.

Standard stock sizes are available for immediate shipment. If your tools are your own design, please mail us blue prints for our files.

We have special equipment for repairing used tools. Write for prices. High quality workmanship and prompt delivery guaranteed.

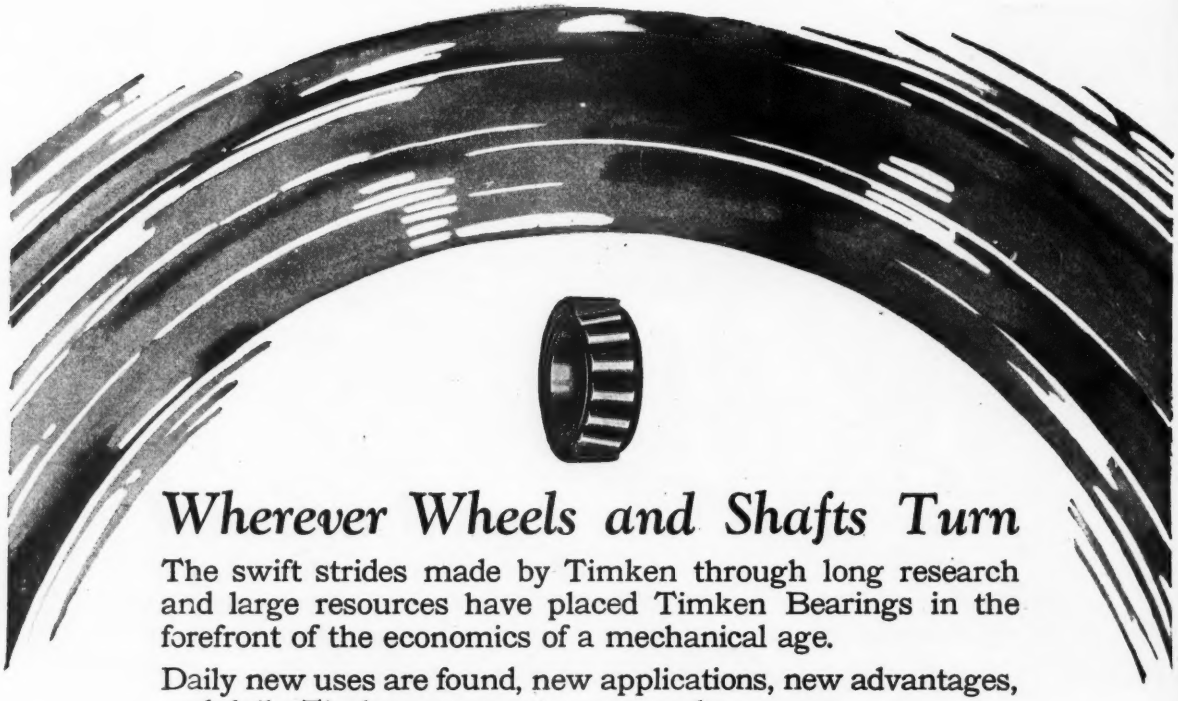
We invite your inquiries.

Woodings Forge and Tool Co.

Works and General Sales Office

Verona, Pa.

WOODINGS STANDARD TRACK TOOLS



Wherever Wheels and Shafts Turn

The swift strides made by Timken through long research and large resources have placed Timken Bearings in the forefront of the economics of a mechanical age.

Daily new uses are found, new applications, new advantages, and daily Timken sweeps to new peaks.

At every turn—in industry, transportation, mining and agriculture—Timken Bearings are at work in railroad and street car journals, motor cars, buses, trucks and machinery of all kinds, opposing friction with anti-friction, waste with saving.

Wherever power is applied through moving parts, Timken Bearings are bettering the work of the world—holding friction in check, carrying radial and thrust loads, resisting wear, cutting production costs and increasing production wherever wheels and shafts turn. "Timken-Equipped" is an important guide for any machinery buyer to follow.

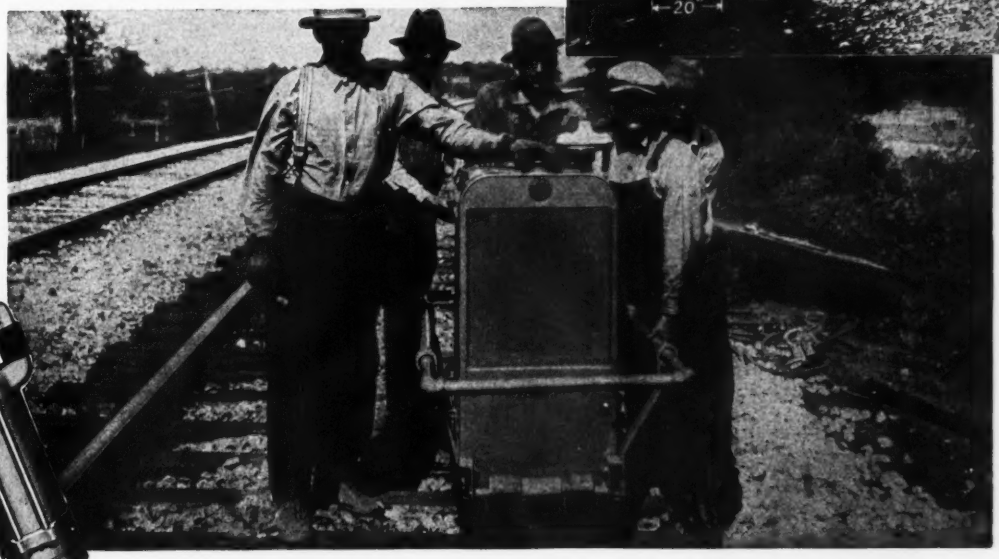
THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

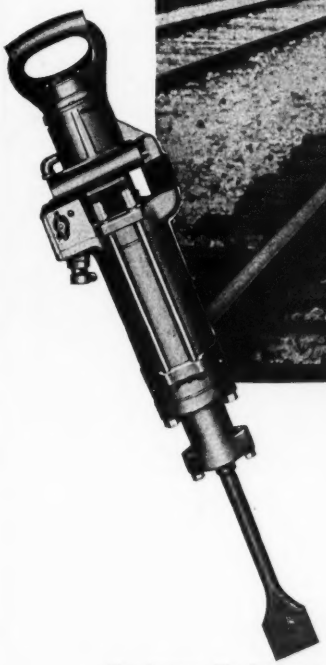
TIMKEN

Tapered

ROLLER BEARINGS

Easily lifted— —Quickly moved





The Syntron Tie Tamper is gearless and motorless. Nothing moves but the piston, and it cannot be stalled or overloaded. It is driven by the Syntron Power Unit instead of a cumbersome compressor. Each tamper easily cradles "in the lap" of the worker, eliminating strain and back-breaking.

THE speed and ease with which the Syntron Tie Tamping outfit can be moved about is one of the reasons why these efficient outfits are of so much practical value to railroads. Five men can easily lift the Syntron Power Unit. Dolly wheels on the bottom enable it to ride on the rail. In ten minutes it is moved a thousand feet. When off the rail, in use or out, the Syntron Power Unit rests on the track shoulder. Only 20 inches wide, weighing only 750 lbs., there is no danger of mishaps and fewer men are required for the job.

Each Syntron Electric Tie Tamper delivers 1,500 powerful blows a minute; packs the ballast with a vise-like grip; makes a smooth, firm bed that will outlast hand tamped track by two or three times. Four men with a Syntron Outfit will do the work of twelve men with tamping picks.

Write for literature illustrating and describing the complete Syntron Outfit. No obligation whatever. Address

SYNTRON COMPANY
Lexington Ave. - Pittsburgh, Pa.

SYNTRON

Gas-Electric Power Units

Tie Tampers *and* Track Tools

TRACK AND TURNOUT ENGINEERING

By C. M. Kurtz

Assistant Engineer, Engineering Department, Southern Pacific Company

THIS new handbook on the design of standard track fixtures, turnouts, etc., is for location, construction and maintenance of way engineers, transitmen and draftsmen, in field and office.

The practical mathematical treatment of track layout and other problems is the outstanding feature of this book. These are *fully exemplified* and worked out in detail.

Mr. Kurtz has had more than twenty-five years' experience as a railroad engineer. The problems outlined are taken from actual pratice.

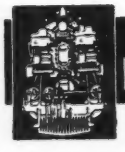
A. R. E. A. definitions of General Track, Split Switch, Frog, Crossing, Yard and Terminal terms appear in the respective chapters as listed below. Solutions of vertical curve problems are presented in three ways, all outlined in a simple manner, and thoroughly demonstrated.

Formulae and simple processes for computing the dimensions or elements of Slip-switches, Turnout and Crossing Layouts, the several kinds of Yard Layouts, in fact, all computing problems which may arise in TRACK ENGINEERING are treated in such ways as to be readily accessible and clearly understood.

The text is fully illustrated by over 116 drawings showing the best of accepted designs for fixtures and track layouts. Original tables which facilitate the solution of turnout location problems when the turnout springs from tangent and from the inside or outside of curved track are featured. Other original tables provided are the following: Reverse Curve Center Distances and Angles; Crossover Elements for Standard Turnouts, Nos. 6 to 16, inclusive, and for tracks 12 to 20 ft. on centers; Crossover Elements when Turnouts are of different Numbers; Simple Curve Elements and Formulae.

A complete set of practical railway engineering tables is also provided, including the following: Radii; Minutes in Decimal of Degree; Tangential Offsets; Long Chords; Mid-Ordinates to Long Chords; FUNCTIONS OF A ONE-DEGREE CURVE; Natural and Logarithmic Trigonometrical Functions, etc.

The book will prove invaluable to students as well as experienced engineers who realize the importance of having a large body of information, practically compiled, and in compact form ready for use.



SIMMONS-BOARDMAN

FREE EXAMINATION COUPON

Simmons-Boardman Publishing Company,
Book Department, 30 Church Street, New York, N. Y.

Please send me postpaid for ten days' free examination a copy of Track and Turnout Engineering. I will either return the book or remit $5.00.

NAME.....

ADDRESS.....

CITY..... STATE.....

POSITION..... COMPANY.....

MT-1-29

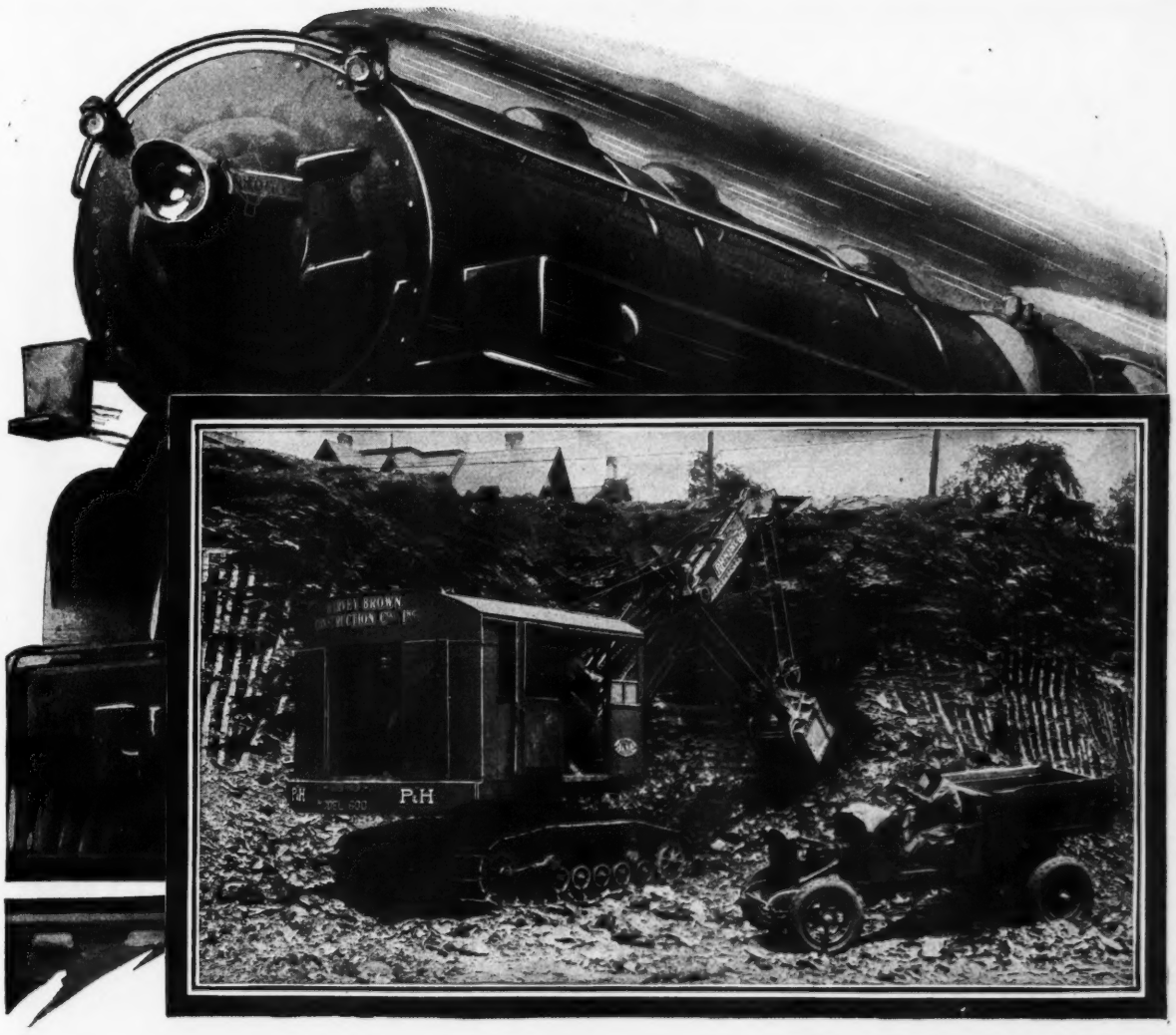
CONTENTS

Definitions of General Track Terms—Design of Split Switches—Design of Frogs—Design of Movable Point Crossings and Slip Switches—Design of Crossing—Design of Split Switch Turnout Layouts — Turnouts Connecting with Divergent Tracks—Connecting Tracks — Wye Tracks — Siding Connections — Crossovers—Yard Layouts — Crossing Layouts — Solution by Traverse — Vertical Curves — Easement Curves and Superelevation—Tables.

457 pages, 116 illustrations, 33 tables, flexible binding, 5x7, $5.00 postpaid.

FOR 10 DAYS' FREE EXAMINATION

Just Clip and Mail The Coupon



P&H

Digging New Right-O'-Way for the Missouri Pacific

Here's a tough job of railroad grading . . . This P & H Shovel is digging hard shale, and you can judge by the tooth marks in the bank that there is plenty of power back of the dipper *and there is*—85 honest horsepower.

Not only is there plenty of power, but there is also the P & H patented Chain Crowd which is powerful enough to force the dipper into the toughest digging, and so accurate that it will cut within an inch of grade.

Railroads like the Southern Pacific, Union Pacific, Canadian Pacific, Delaware and Hudson, Seaboard Air Line and others are using P&H Shovels.

There are more P & H Gasoline Shovels in service than any other make. Take advantage of P&H experience the next time you select a shovel.

HARNISCHFEGER CORPORATION

Established in 1884

3820 National Avenue, Milwaukee, Wis.

Birmingham Atlanta Charlotte Los Angeles Detroit
Philadelphia Chicago Indianapolis Minneapolis Dallas
New York Kansas City Jacksonville Des Moines Baltimore
Pittsburgh St. Louis Cleveland Memphis
Portland Boston San Francisco Seattle

WAREHOUSES AND SERVICE STATIONS

Philadelphia, Memphis, Jacksonville, San Francisco, Los Angeles, Seattle

Specify

Casey Jones

Product of NORTHWESTERN MO

You can safely specify Casey Jones with the assurance of complete satisfaction, of lowest first cost, of lowest cost of operation and lowest cost of replacement parts.

Advanced Engineering and mechanical improvements ahead of all others, is the keystone of Casey Jones success.

An openminded organization, alert to grasp the recommendations of experienced railway men, co-operates with a keen and sensible engineering staff to produce a product of marked superiority.

THE QUALITY OF Casey Jones PRODUCTS is recognized through adoption and use with most satisfactory results by many leading railways.

NORTHWESTERN MOTOR COMPANY

FOR 1929

REG U.S. PAT. OFF.

TOR COMPANY, Eau Claire, Wis.

A Complete Line of Motor Cars and Equipment for Every Railway

THE RIGHT TYPE OF CAR FOR EVERY CLASS OF SERVICE

CLASS	TYPE	H. P.	CAPACITY	SERVICE
CLASS A	Casey Jones 551	22	4 TO 150 MEN - TRAILERS	HEAVY DUTY
CLASS A	Casey Jones 551-H	22	20 MEN	HUMP SERVICE
CLASS A	Casey Jones 551-D	22	8 MEN - ENCLOSED	OFFICIAL INSPECTION
CLASS A	Casey Jones 555	22	10 MEN - ENCLOSED	OFFICIAL INSPECTION
CLASS BB	Casey Jones 523	8	2 TO 60 MEN - TRAILERS	EXTRA LARGE SECTION
CLASS B	Casey Jones 521	6	2 TO 30 MEN - TRAILERS	STANDARD SECTION
CLASS C	Casey Jones 531	4	1 TO 4 MEN	LIGHT INSPECTION

MODERN MOTOR CAR EQUIPMENT FOR EVERY PURPOSE

DISCER	Casey Jones 581	22	ALL DISCING WORK	BALLAST IMPROVEMENT
TRAILER	Casey Jones 552		24 MEN - SEATED	MOVING LARGE GANGS
PUSH CAR	Casey Jones 500		6000 POUNDS	WORK CAR

MOTOR CAR FRAMES AND CHASSIS OF ALL TYPES - SPECIAL MOTOR CARS - MOTOR CAR ENGINES 4-6-8 HORSEPOWER - REPLACEMENT AXLES AND BEARINGS - MOTOR CAR SUPPLIES

HYATT - TIMKEN AND BOWER ROLLER BEARINGS

WRITE FOR INFORMATION—SEND US YOUR INQUIRIES

Factory and Home Office: Eau Claire, Wis.

No. I of a series

PUBLISHER OF
RAILWAY AGE
RAILWAY MECHANICAL ENGINEER
RAILWAY ENGINEERING AND MAINTENANCE
RAILWAY ELECTRICAL ENGINEER
RAILWAY SIGNALING
MARINE ENGINEERING AND SHIPPING AGE
THE BOILER MAKER

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING COMPANY

PUBLISHER OF
LOCOMOTIVE CYCLOPEDIA
CAR BUILDERS' CYCLOPEDIA
RAILWAY ENGINEERING AND MAINTENANCE CYCLOPEDIA

BOOKS ON TRANSPORTATION SUBJECTS

"THE HOUSE OF TRANSPORTATION"

NEW YORK 30 CHURCH STREET | CHICAGO 105 WEST ADAMS ST. | CLEVELAND 6007 EUCLID AVE. | WASHINGTON 17TH AND H STS. N.W. | SAN FRANCISCO 215 MARKET STREET

ADDRESS REPLY TO
105 WEST ADAMS ST.
CHICAGO, ILL.

December 28, 1928

Dear Reader:
Everywhere

To me the most interesting thing about a railway is not the locomotives or the cars, the tracks or the bridges, or even the service rendered the public, but the men who make this service possible - the real flesh-and-blood human beings who man the roads. I am interested in these men, for my work constantly brings me in contact with them. From East to West, from Canada to Mexico, I know them and because I know them, I like them.

Because of this experience, it is my wish that you, for whom we publish our paper, shall know us better. I am, therefore, planning a series of letters to you, which will appear in this location from month to month, in which I want to tell you something of ourselves, of our problems and of our ideals in a less formal and more intimate way than would be appropriate in the editorial pages. In these letters, I want to tell you something of my associates, their experience and their part in the publication that is laid on your desk every month.

I want to tell you also of the men who supplement the work of our editorial staff by contributing of their experience for the improvement of railway practices. I want to tell you from time to time of interesting contacts with readers in remote corners of the world. I want also to tell you of the organization and methods of collecting and presenting the information appearing in our pages. In short, I want to develop such an intimate and friendly relationship with you that you and I, although we may never meet, may come to regard each other as friends and take a friend's interest in each other.

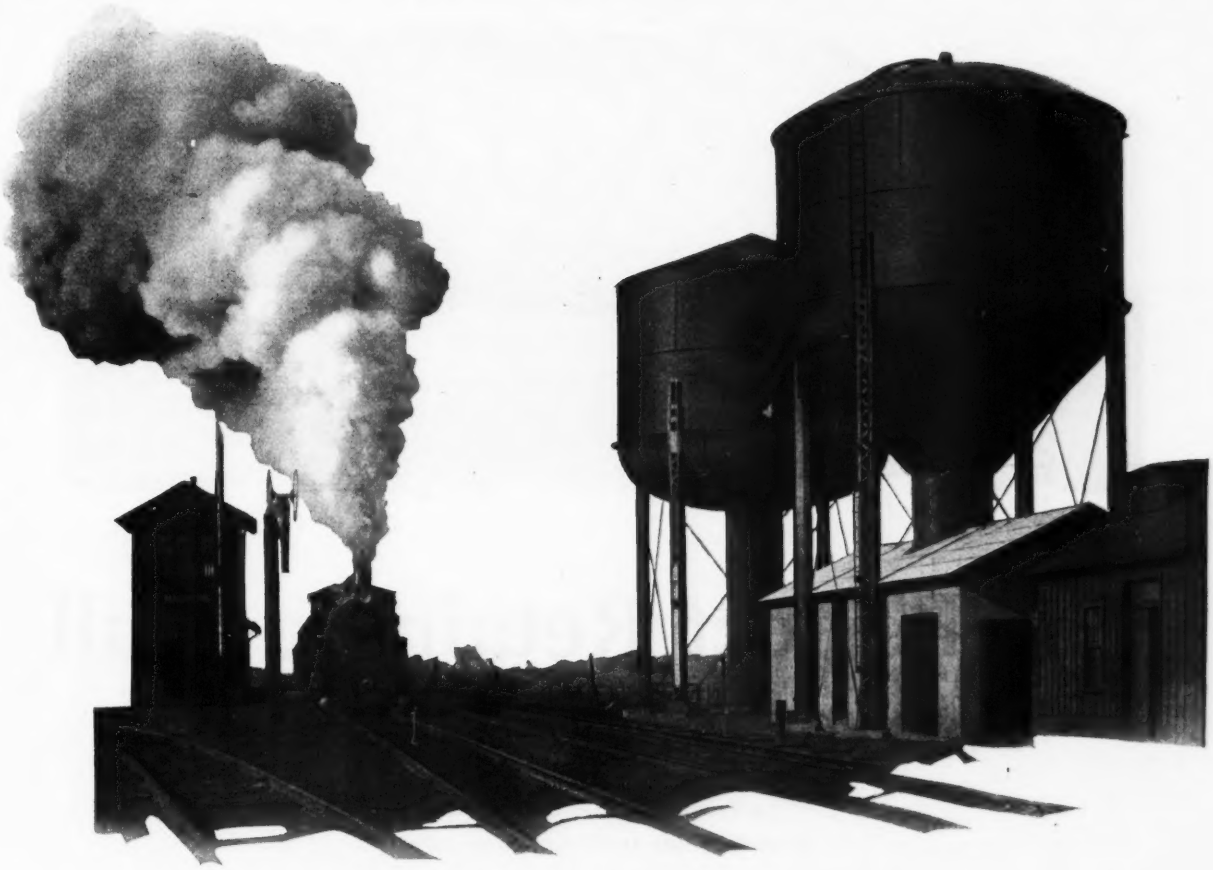
You will hear from me in this space from month to month. I, in return, would like to hear from you and receive your suggestions regarding the character of material that you would like to see in our columns. I want to learn of interesting work that you have had a part in or that has come under your observation. I would like to know also of changes in personnel, within the ranks covered in our news columns. In short, I solicit your help in making Railway Engineering and Maintenance the kind of a magazine, in every respect, that you want and need in your work.

Yours truly,

Elmer T. Howson

Editor.

Members: Audit Bureau of Circulations and Associated Business Papers, Inc



Use STEEL Tanks at Roadside Water Stations

Horton tanks are constructed entirely of steel. They have a long life which makes their first or investment cost low. The fact that they are built entirely of steel makes their maintenance cost low, too. A coat of paint every few years keeps them in first class condition. Heavy repair and replacement costs are eliminated.

The particular design of Horton elevated railroad tanks also adds operating savings to their credit. Sediment from the water is removed from the tank through a washout valve in the bottom of the large riser. The outlet pipe arrangement does not allow such sediment to be carried into locomotive tenders and then into boilers, lowering their efficiency and necessitating frequent cleaning.

Standard tanks for roadside delivery, water softening, fire protection and oil storage are described in our booklet entitled "Meeting Railroad Requirements with Horton Steel Tanks." Ask for a copy of this booklet and for quotations on installations you contemplate making this year.

B-55

CHICAGO BRIDGE & IRON WORKS

Chicago	2452 Old Colony Bldg.	Detroit	1519 Lafayette Bldg.
New York	3156 Hudson Term. Bldg.	Philadelphia	1609 Jefferson Bldg.
Cleveland	2202 Union Trust Bldg.	Atlanta	1036 Healey Bldg.
Dallas	3309 Magnolia Bldg.	San Francisco	1007 Rialto Bldg.

HORTON TANKS

Retaining wall erected by Boston & Maine RR at Manchester, N. H., of Federal 2-piece concrete cribbing units. Read the story below.

The Perfect Retaining Wall for Industrial Sidings

Every railroad has the problem of providing side track service to industries along the right of way, with the least interference and fewest changes.

Note the Y-shaped headers which interlock with the stretchers, holding the backfill without the use of a third member in the bank. This results in a cellular wall of great strength and with no plane of cleavage.

The Boston & Maine erected the Federal retaining wall shown above, for this purpose, achieving at once all the convenience of cribbing construction—the economy of 2-piece design—speed of erection—the strength and permanence of a stone wall—and—important for industrial plants — a ***closed face*** wall, attractive in appearance and requiring no maintenance.

Booklet "The Ideal Retaining Wall" on request.

You Can Build This Retaining Wall *in Winter!*

These precast units come to the location ready to lay, being simply unloaded direct from car to wall. Cold weather is therefore no bar—the units are handled as readily—erection goes on as easily—in winter as in summer.

FEDERAL CEMENT TILE COMPANY, 608 South Dearborn Street, Chicago, Illinois

Concrete Products *for Over 25 Years*

FEDERAL 2 piece Concrete CRIBBING

ELMER T. HOWSON, *Editor*
WALTER S. LACHER, *Managing Editor*
NEAL D. HOWARD, *Eastern Editor*
F. M. PATTERSON, *Associate Editor*

Railway Engineering and Maintenance

Name Registered U. S. Patent Office
Formerly the Railway Maintenance Engineer
Published on the last Thursday preceding the month of issue by the
Simmons-Boardman Publishing Company
105 West Adams Street, Chicago

F. C. KOCH, *Business Manager*
H. F. LANE, *Washington Editor*

CONTENTS FOR JANUARY, 1929

Editorials 1

A review of 1928, an active year in roadway improvements and maintenance of way

Ballast Cleaner on the Pennsylvania..... 4

Enormous screening machine completes work on a mile of track in a day

Announce Track Awards 7

Five railroads report results of annual track inspections and confer prizes

Why Maintenance Men Get Together.... 9

H. R. CLARKE *presents a resume of the benefits of membership in associations*

Novel Air Supply for Power Tools..... 12

Pipe rig supported on wheels speeds work of pneumatic equipment in rail laying

Consolidated Stores Help Deliveries..... 14

Boston & Maine secures economies by combining plants at seven scattered points

Safety in Maintenance of Way Work..... 17

Papers by W. L. ROLLER *and* H. S. OSBORNE *contain valuable suggestions*

Is Winter Rail Laying Practical?..... 20

Report presented before Metropolitan Track Supervisors Club discusses this question

Track Encased in Pavement..... 22

Rock Island encloses ties and rails in concrete slab in a street at Topeka, Kan.

Something New in Inspection Cars..... 23

Cadillac car equipped with flanged wheels develops speed of 75 miles per hour

What I Got from the Convention..... 24

Bridge foreman gives enthusiastic account of bridge and building meeting at Boston

What's the Answer?..... 25

New and Improved Devices..... 32

With the Associations..... 34

Railway News Briefly Told..... 35

SIMMONS-BOARDMAN PUBLISHING COMPANY, Edward A. Simmons, *President;* Henry Lee, *Vice-Pres. & Treas.;* Samuel O. Dunn, *Vice-President;* L. B. Sherman, *Vice-President;* C. R. Mills, *Vice-President;* F. H. Thompson, *Vice-President;* and Roy V. Wright, *Secretary.*

Subscription price in the United States, Canada and Mexico, $2.00 per year; foreign countries $3.00. Single copies, 35 cents.

New York: 30 Church Street
Chicago: 105 W. Adams Street
Cleveland: 6007 Euclid Ave.
Washington, D. C.: 17 and H Streets N. W.
San Francisco: 215 Market Street

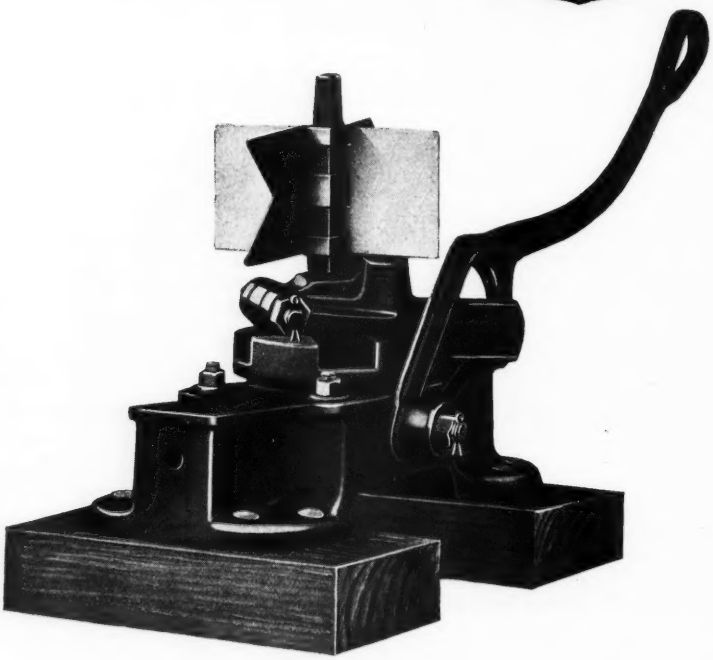
Publishers also of
Railway Age — Railway Mechanical Engineer
Railway Signaling — Airway Age
Railway Electrical Engineer — The Boilermaker
Marine Engineering and Shipping Age
Railway Engineering and Maintenance Cyclopedia
Car Builder's Cyclopedia — American Builder
Locomotive Cyclopedia — Building Developer

Member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

Request for change of address should reach us two weeks before the date of the issue with which it is to go into effect. In sending us change of address please be sure to send us your old address as well as the new one.

Entered at the postoffice at Chicago, Ill., as mail matter of the second class.

RACOR
TRADE MARK



(Style No-20-B)

SAFE UNDER ALL CONDITIONS

THIS switch stand incorporates an automatic safety feature which makes it impossible to damage either stand or switch points if trailed through when set in closed position.

The Ramapo Safety Stand is designed to work ordinarily as a simple hand thrown device, with ample strength for the heaviest requirements. The safety device is part of the base mechanism and does not affect the hand operation. When the points are thrown over by the wheels the force is great enough to operate this mechanism, consisting of a star cam and heavy springs, which, in turn, revolve the spindle carrying the target. The target always indicates the actual position of the switch points. The stand is always left ready for normal hand throw.

Over three hundred thousand Ramapo Safety Stands are in use on over three hundred railroads.

RAMAPO AJAX CORPORATION

Sales Offices - 30 CHURCH ST., NEW YORK
McCORMICK BUILDING, CHICAGO
METROPOLITAN BANK BLDG, WASHINGTON
BUILDERS EXCHANGE BLDG, ST. PAUL
ALSO AT ALL WORKS

Eight Works—
Hillburn, N.Y. Niagara Falls, N.Y. Chicago, Illinois, East St. Louis, Ill.
Pueblo, Colorado, Superior, Wis. Los Angeles, Cal. Niagara Falls, Ont.

Railway Engineering and Maintenance

Volume 25 January, 1929 No. 1

1928 a Good Year; 1929 Looks Still Better

THE YEAR which has just closed was a successful one from the standpoint of the engineering and maintenance of way departments. Not only was the active improvement program of recent years well maintained but the expenditures for the current maintenance of the properties fell only slightly below the high level of the year before. The year was singularly free from disastrous floods and other conditions unduly adverse to maintenance work. As a result, the tracks and structures enter the new year in better condition than ever before and better prepared to withstand the heavy demands of traffic that present indications forecast for 1929.

From the standpoint of the railways as a whole, the year was one of contrasts. Operating revenues were slightly less than in the preceding year, while net railway operating income was larger. It was equivalent, however, to a return of only 4.65 per cent on the property investment. While this exceeded the return of 4.28 per cent in 1927, it fell below the return of 4.98 in 1926 and still further below the return that has been fixed by the Interstate Commerce Commission as fair.

Marked Contrast in Traffic

From the standpoint of traffic, 1928 presented a marked contrast with the year preceding. The year 1927 opened with business at a high level but by midsummer a decline set in which continued well into 1928. By June of last year this trend had spent itself and in July traffic showed an increase as compared with the preceding year. Since that time traffic has continued to increase and has approached more closely to that of the record year of 1926. For the year as a whole, freight traffic was of almost exactly the same volume as in 1927, being about four per cent below that of the preceding year for the first six months and about four per cent above 1927 for the second six months. While car-loadings for the year approximated 51,600,000 as compared with 51,633,000 in 1927, the net ton miles for 1928 are estimated at 475,000,000,000 or about one-tenth of one per cent greater than in 1927, although still 2.8 per cent below the peak of 1926.

In passenger traffic the decline which has been in progress since 1920, and which was thought by some to have run its course a year or two ago, continued through 1928, being evident in every month of the year and aggregating 6.4 per cent for the entire period as compared with 1927. The total volume of passenger traffic was less in 1928 than in any year within the last twenty and was 32.8 per cent below the record level of 1920.

From the standpoint of the service rendered the public, the year was one of outstanding accomplishment as the following records show:

1—Fewer trains and locomotives, in proportion to the amount of traffic hauled, were required in 1928 than ever before.
2—The average load per train was the highest ever reported, having been 2.6 per cent greater for the first 10 months of 1928 than in the same period in 1927.
3—The distance traveled each day per freight train averaged more than 307 miles, an increase of approximately 20 per cent over that for 1923, when the average was 259 miles.
4—The number of tons of freight moved one mile by a train per hour was greater in 1928 than ever before.
5—Freight traffic in 1928 was handled with the greatest conservation of fuel ever reported, coal consumption per thousand gross ton miles having been 125 lb., compared with 129 lb., in 1927.

Notwithstanding an exceedingly heavy movement of grain and grain products, as well as perishable traffic, there was an almost complete absence of car shortages and congestion, and the traffic was moved more promptly in 1928 than ever before.

These records have been made possible by reason of the large expenditures that have been made during the last few years for the enlargement and strengthening of roadway facilities. The completion of a wide variety of improvements which have provided added capacity at many points, has relieved congestion and eliminated many delays. Likewise the general strengthening of the tracks and structures has not only enabled trains to move more rapidly, but has eliminated many delays from slow orders, derailments and other roadway deficiencies. It is due to this fact in no small degree that freight train speeds have risen consistently from 10.8 miles per hour in 1923 and 12.3 miles per hour in 1927 to 12.8 miles per hour in the first 10 months of 1928. While the net tons per loaded car declined from 27.2 in 1927 to 26.6 tons in the first 10 months of 1928 (a condition which is largely beyond the ability of the railways to control) the increased train loading, which is made possible in no small degree by better track, was able to overcome this with the result that the net tons per freight train rose from 785 in the first 10 months of 1927 to 793 in the same period of 1928. Even more striking was the increase in gross tons per train hour which rose from 22,013 during the first 10 months of 1927 to 23,623 in the same period of 1928.

A Large Improvement Program

The year that has just closed was noteworthy because of the continuation of the large program of improvements inaugurated by the railways following their return to private control in 1920. In this period of nine years, a total of $6,500,000,000 of new money has been expended for capital improvements, or an average of

$735,000,000 per year. While this average was not maintained during 1928, the expenditure did not fall far short of this figure. Data compiled by the Bureau of Railway Economics for the first nine months of 1928 show that the Class I roads expended $500,167,000 in this period as compared with $570,215,000 for the same period of 1927. On this basis the bureau placed the total capital expenditures for the year at $650,000,000.

From the standpoint of the roadway and structures department, however, these figures have a special interest, for during the last five years the percentage of the total capital expenditures allotted to roadway improvements has practically doubled. This trend is shown in the following figures:

Year	Total Capital Expenditures	Expenditures for Equipment	Per Cent of Total	Expenditures for Roadway	Per Cent of Total
1923	$1,059,149,426	$681,723,991	64	$377,425,435	36
1924	874,743,228	493,608,460	56	381,134,768	44
1925	784,191,000	338,114,000	45	410,077,000	55
1926	875,000,000	380,000,000	43	495,000,000	57
1927	771,552,000	288,700,000	37	482,852,000	63
1928 (first 9 months)	500,167,000	165,967,000	33	334,200,000	67

While there has been some slackening in roadway expenditures chargeable to capital account during the last two years, it is evident from these figures that the reduction has been far less pronounced in this field than elsewhere.

In contrast with the decrease in roadway expenditures in 1928 as compared with 1927, it is interesting to note that the mileage of new lines completed last year, 1,025, was the largest for any year since 1916 and was an increase of 246 miles over the total completed in 1927. This is accounted for largely by the completion during the year, of several large projects, which have been started during previous years. Among these were 205 miles built by the Colorado & Southern in Western Texas, 120 miles of alternate main line of the Illinois Central in Illinois and 94 miles of a 150-mile extension built by the St. Louis-San Francisco to gain an entrance to Pensacola, Fla. These three lines, two of which were placed in service early in the year, comprise more than 40 per cent of the total mileage completed during 1928.

Smaller Mileage of Second Track

In contrast with the increase in mileage of new lines built last year, the mileage of second track completed was only 271, as compared with 447 miles built in the preceding year. This continues the trend which has been evidenced since 1925 and reveals the extent to which the roads are securing needed added capacity by the installation of automatic signaling, the operation of junction and passing track switches by remote-control switch machines and other expenditures to eliminate delays to trains.

Other important roadway improvements completed during the year included the 7¾-mile tunnel, the reconstruction of 16½ miles of line on the east approach and the electrification of 80 miles of line on the Great Northern in its crossing of the Cascade mountains in Washington, the 4 900-ft. double track Musconetcong tunnel of the Lehigh Valley and the three-track lift bridge of the Delaware, Lackawanna & Western over the Hackensack river in New Jersey, the extensive freight classification yard of the Texas & Pacific at Ft. Worth, Tex., and the new North station of the Boston & Maine at Boston. Work was also prosecuted actively during the year on such outstanding projects as the Union Terminal at Cleveland, the new bridge that the Pennsylvania and the Lehigh Valley are building jointly over Newark Bay, the bridges over the Ohio river at Cincinnati and Louisville, and the passenger station of the New York Central at Buffalo, while rapid progress is being made in the development of plans for the new union passenger terminal at Cincinnati. In contrast with these activities, another significant trend of the times is evidenced by the fact that 512 miles of lines were abandoned and taken up in 1928.

Equipment Expenditures Decline

The fact that 1928 was another roadway year is borne out not only by the decreasing proportion of the total capital expenditures that went for equipment but also by the marked decrease in the amount of equipment built. Equipment orders in every instance, with the exception of passengers cars and motor coaches, fell below those of 1927. The number of locomotives ordered during the year for service in the United States totaled 603, the smallest in seven years and comparing with 734 in 1927 and 1,301 in 1926. In only two years since 1902 have fewer locomotives been ordered than in the last year.

The number of new passenger train cars ordered during the year for service in the United States totaled 1,930 or 318 more than in 1927, although with the exception of that year and 1926 the total was the smallest of the last seven. The Pennsylvania was the largest single purchaser of passenger train cars, having placed orders for a total of 1,150 cars or more than half of the total ordered. The purchases of freight cars in the United States for service in this country totaled only 51,200 or less than in any year in the last 28 except the two abnormally poor years of 1919 and 1921.

In addition to this equipment the railways of the United States placed orders for 175 internal combustion engine rail motor cars and trailers in 1928 as compared with 180 in 1927 and 142 in 1926. They also ordered a total of 227 new motor coaches for highway service during the year as compared with 132 in 1927 and 119 new motor vehicles of other types as compared with 82 such vehicles in 1927.

Maintenance Expenditures Large

Like capital expenditures, those for the maintenance of roadway facilities were smaller last year than for the preceding year, although the decrease was less marked for maintenance than for improvements, being 3.8 per cent for the first nine months of the year. That this decrease has not been at the expense of the program for strengthening the tracks, however, is indicated by the preliminary analysis of capital expenditures for the first nine months of 1928, which shows that in the face of a decrease of 8.5 per cent in all roadway expenditures the outlay for additional ballast was nearly 20 per cent greater in 1928 than in 1927, while the expenditures for heavier rail were less than in the preceding year by only a fraction of one per cent. Furthermore, since the ratio of decrease in expenditures for maintenance was smaller in the late summer than earlier in the year, it is to be expected that the figures for the year, when available, will show a decrease of only about 3 per cent from the 1927 figures, which were at the record high level.

Since the year was devoid of abnormal destruction of property such as the floods which prevailed in the lower Mississippi Valley in the early summer of 1927 and in New England late that fall and since the weather was more than usually favorable for maintenance work through the summer, it is evident that last year will equal if not excel its predecessors in the amount of constructive work done on the properties.

The year was equally satisfactory from the standpoint of labor. Not only was it free from disturbances

and unrest but the turnover was less than usual. In fact, the roads are, by various means, progressing steadily towards a more permanent maintenance force. The graduated wage scale installed on one large road by decision of an arbitration board and installed on another voluntarily is one means of solving this problem. The rearrangement of maintenance work to provide employment for a larger proportion of the forces throughout the year is gaining ground slowly, although the election to the presidency of Herbert Hoover, who has long advocated such measures, is expected to give new impetus to this movement. That the present fluctuations in maintenance of way forces constitute a severe drain on the efficiency of this department is evident from the fact that the spread between the maximum and minimum forces still exceeds 150,000 men.

In spite of the magnitude of the improvement and maintenance programs last year, the supply of labor has been adequate in practically all localities. Section labor is being drawn to an increasing extent from the local communities, a factor which contributes to stability of the force and thereby to efficiency. The passing of the "hobo" from extra gang work and his replacement with probably less picturesque but more dependable employees has also reacted favorably on the efficiency of the year's work.

One factor which has contributed more forcibly to the stability of labor during the year than in any previous period has been the steady increase in the use of mechanical equipment. This has been evidenced by the more general use of such established devices as tie tampers and motor cars and also in the increased application of new equipment such as power rail laying cranes and ballast cleaners. While the use of such equipment has not yet progressed to the point that its effect is indicated in a decrease in the forces required for the maintenance of the tracks of the country as a whole, this effect is becoming evident on individual roads that have made the greatest progress in this direction.

Important Technical Developments

The last year has witnessed several scientific developments of an outstanding character, the most important of which was the perfection of a device for the detection of transverse fissures in rails. After the extensive tests in the laboratory and on the track, two of these machines were placed in service late in the year and have demonstrated their ability to locate this dangerous defect. By detecting these fissures and removing the rails which contain them from track, a means for the control of the most serious roadway hazard to travel is now available. Another development which has received increased support during the year is the rapidly growing use of medium manganese rail. More than a quarter of a million tons of this rail is now in service, where it is giving promise of increasing the life of the rail and at the same time reducing the number of failures.

Although the railways have been pioneers in the treatment of timber and still use more than 80 per cent of all of the timber that is treated today, they have increased their use of it markedly during the last two or three years. This is evidenced by the percentage of treated ties to the total installed which has risen from 43 per cent as recently as seven years ago to approximately 75 per cent in 1928. The use of treated ties has been responsible for a decrease in the railroads' annual requirements for ties to such an extent as to create surplus capacity in railway as well as in commercial plants, which is leading the roads to extend treatment more generally to timbers for bridge work and a wide variety of other uses, thereby retarding the transition to other forms of construction.

The New Year Looks More Active

Although the year which has just closed has been an active one for the roadway department, the indications are that the year now opening will be considerably more active. Traffic is now running about ten per cent above that of a year ago, while net earnings have been even more favorable in recent months. As a result, railway executives are entering the new year in a more optimistic frame of mind than a year ago. Among those executives who have expressed themselves regarding the outlook for the new year, a number are planning larger expenditures than in 1928, many look for programs equalling those of last year and practically none look for smaller ones.

This attitude is verified by a survey of the budgets of leading roads, to be presented in the Annual Statistical Issue of the *Railway Age* of January 5. This survey is based on a study of the complete budgets of 23 roads with a combined mileage of 70,000, supplemented by partial figures from other roads with 22,000 miles of additional lines, and with total and partial estimated expenditures of more than $325,000,000. On the basis of these figures the *Railway Age* estimates that the capital expenditures of all the roads of the United States and Canada will approximate $800,000,000 in 1929 or more than $50,000,000 in excess of those for 1928. These budgets include a considerable mileage of new lines. They consist even more largely than usual, however, of the wide variety of other expenditures that go to keep a modern railway property abreast of the various demands made on it.

A Record Year in Canada

In Canada, 1928 was the best year in the history of the railways. The gross earnings of the two principal systems exceeded those of the preceding year by 12 per cent, while the net operating income was greater by 32 per cent. This prosperity was reflected in greatly increased activity in both construction and maintenance. A total of 783 miles of new lines was completed last year, or more than in any year since the outbreak of the war in 1914. Of this the Canadian Pacific completed 375 miles and had 55 miles additional under construction at the end of the year, while the Canadian National built 144 miles of new lines and was engaged in the construction of 166 miles more at the close of the year.

In Mexico the recovery, while not as rapid or as complete as in Canada, was marked during the year. The management of the largest system, the National Railways of Mexico, made marked progress in overcoming the destruction and the neglect of the years of revolutions, and the important main lines are approaching their earlier high standards of maintenance. During the year a number of important projects were undertaken for the purpose of effecting economies in operation, including the reconstruction and enlargement of the facilities for the treatment of ties and the enlargement and consolidation of the shop facilities for the repair of locomotives. On the other railways of Mexico, the the more important improvement work included the reconstruction of a short section of the Southern Pacific line in Jalisco, the addition of 40 miles to the Kansas City, Mexico & Orient line in Chihuahua and the extension of the electrification on the Mexican railway near Vera Cruz.

Ballast Cleaner o
Completes a M

Three Views of the Machine—Left, the Distributing Hopper—Below, the Ballast Plow—Right, the Conveyors and Screens

EARLY last summer the Pennsylvania placed in service on its lines one of the most elaborate units of maintenance of way equipment that has yet been built—a car-mounted, self-operated ballast renovating machine, and after six months operation, the results effected are viewed with a large degree of satisfaction. Within this period, this machine has demonstrated its ability to excavate the dirty ballast from the track, remove the dirt and return the cleaned ballast to the track at the rate of about 1,200 ft. of track per hour of uninterrupted service. On a number of days, working two shifts under average operating conditions, the machine cleaned in excess of 9,000 ft. of track.

The equipment in question is the ballast-cleaning machine of the Industrial Brownhoist Corporation, which was designed and built in an effort to provide a more rapid, effective and economical means of cleaning ballast than has been employed in the past. This machine, which was completed and put under test late in the fall of 1927, was described in the January, 1928, issue of *Railway Engineering & Maintenance.*

General Features of Machine

Essentially, the ballast-cleaning machine consists of two main units, one for excavating and hoisting the dirty ballast and the other for screening the ballast. Each of these units is mounted on a steel car frame provided with four-wheel trucks, and when the two units are coupled together to form the complete ballast-cleaning outfit, they have an overall length of approximately one hundred feet. All ballast excavation with the equipment is accomplished by two clam shell buckets. These buckets, which are spaced about fifteen feet center to center, operate in curved channel guides which direct the buckets over the center of the car in their upward movement, and which prevent them from swinging beyond the midpoint of the inter-track space when in the lowered position. Between the buckets there is a plow which can be raised and lowered on guides, which is designed to push the ballast from the far half of the inter-track space to a point within the reach of the rear bucket. With these three elements of the machine, therefore, all of the ballast between the ends of the ties within the inter-track space can be completely removed.

Directly beneath the buckets in their raised positions over the center of the car are receiving hoppers, underneath which an apron conveyor transports the uncleaned ballast to the rear of the car. At this point the ballast is dumped into a hopper which feeds an apron conveyor on the screening car unit of the equipment, which, in turn, carries the ballast to vibrating screens for separating out the refuse. From the screens the refuse is dumped into a dirt chute, from which it is carried by another conveyor to the rear end of the second car, while the cleaned ballast is dropped into a hopper beneath the screens, preparatory to redistribution along the track.

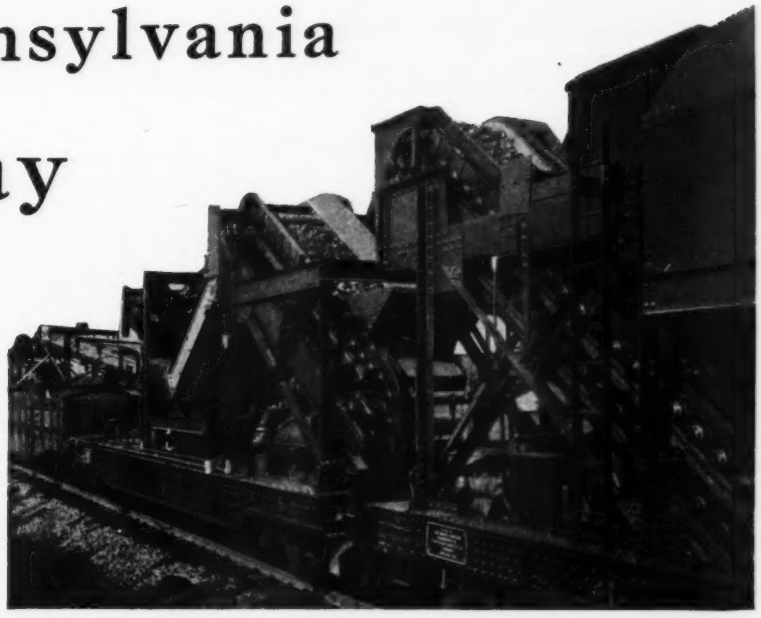
How Refuse Is Disposed of

Two means are provided for disposing of the refuse cleaned from the ballast. This is arranged through the provision of a boom loader, by means of which the refuse may be carried to either side of the track, or dumped into the receiving hopper of a belt conveyor line which extends over a series of dirt cars coupled to the rear end of the equipment. Through this latter method of disposing of the dirt, which is the one commonly used, the refuse from the ballast can be carried successively over the dirt cars

on the Pennsylvania

Mile a Day

Twelve men with newly designed equipment, cover 1200 ft. an hour when not interrupted. Operation is not affected by the weather



which have already been filled, to any particular car, and can be scraped off the conveyor belts at any desired point in a car.

The complete ballast-cleaning outfit, together with the dirt cars, is moved to the site of the work by a locomotive, but in the actual operation of cleaning ballast, the locomotive acts merely as a "dead man" in advance of the equipment, and the equipment itself is moved forward as desired by means of an electric haulage unit mounted on the front end of the excavating car. Through this haulage arrangement, which consists essentially of a drum and a long cable, the locomotive moves ahead over the track for about 500 ft., carrying a cable block, and after its brakes have been set, the operator of the ballast-cleaning equipment can move the equipment forward at will by taking in on the haulage cable.

Power for the operation of all of the equipment on the ballast cleaner, including the distributing conveyors over the refuse cars, is supplied by a gasoline engine-generator set, consisting of a 300-hp. gasoline engine and a 250-kw. generator. This unit also supplies the power required for moving the equipment forward over the track as it carries out its work.

Operation on the Pennsylvania

As operated on the Pennsylvania, the complete ballast cleaning outfit consists of the two units of the ballast cleaner itself, five hopper-bottom (H21) cars, each with a capacity of 140,000 lb., one box car which is used to carry oil, waste, repair parts and miscellaneous supplies, and a caboose. This nine-car outfit, together with the locomotive which accompanies it, is manned by 12 men, including the train crew of an engineer, fireman, conductor and a flagman, an assistant track foreman, three maintenance of way department mechanics, an electrician, two laborers, and a representative of the Brownhoist Corporation. Only six of the men in this force are actually engaged in the operation of the ballast cleaning equipment, one man operating the forward bucket and the plow, a second operating the rear bucket, one man who operates the haulage drum for moving the equipment forward as the work progresses, the foreman who directs the work, and the two laborers who arrange for the proper distribution of the refuse in the ballast cars and do such other general work as may be necessary.

In the operation of the ballast cleaner the ballast is cleaned on only one side of the machine at a time. In actually carrying out the work, the forward bucket excavates the ballast adjacent to the ends of the ties of the track on which the machine is operating, to a point midway between the two tracks. Immediately behind this bucket the plow provided loosens the ballast in the other half of the inter-track space and throws it into the excavation made by the forward bucket, from which it is picked up by the rear bucket.

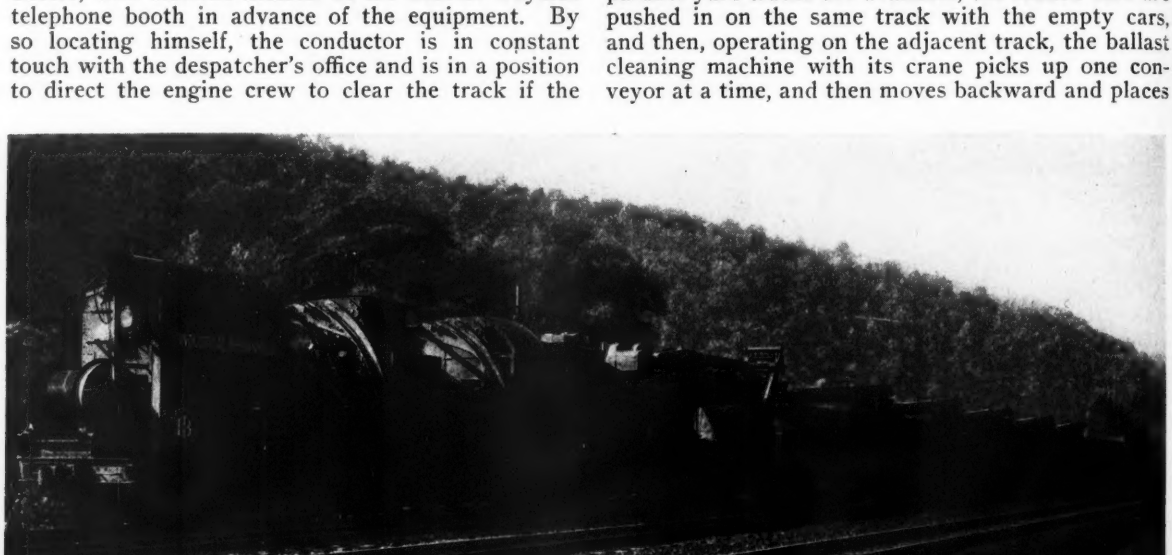
The ballast buckets, each of which has a capacity of one-half cubic yard, are capable of excavating to a maximum depth of 24 in. below the ties, and have a maximum opening of 8 ft., but as operated on the Pennsylvania, the ballast is removed to a depth of from only 16 to 18 in. below the bottoms of the ties, and it is the practice to move the machine forward about seven feet with each grab of the buckets so as to insure removing all of the dirty ballast. Operating in this manner, it is possible to make three grabs per minute with each bucket, covering about twenty-one feet a minute, or a maximum distance of about twelve hundred feet an hour when uninterrupted. The only work of the locomotive while the ballast cleaning equipment is in operation, is to act as an anchor post to which the haulage cable is attached, moving forward only when the equipment works up to it. Each of these moves of the locomotive, which are for a distance of about five hundred feet, requires from 1 to 1½ min.

When the buckets have been filled and raised to their maximum height over the center of the car, they are opened and discharge their contents into the hoppers beneath, from which the dirty ballast is carried by the conveyors to the cleaning screens. From the screens, the refuse passes over the conveyors to the various dirt cars, while the clean ballast falls into the distributing hopper, from which it is returned to

the track. A feature in this connection is a templet, or former-blade, at the rear of the distributing hopper, which reshapes the cleaned ballast section, leaving it in such a neat condition that no further dressing is required.

Operations Stopped for Passing Trains

Operation of the ballast cleaning outfit requires the full use of the track on which the equipment is located, but the equipment is so designed that it operates within clearance limits and therefore does not present a hazard to traffic on adjacent tracks. When actually engaged in cleaning ballast, the outfit is protected from the rear by the flagman of the train crew, while the front end is protected by the conductor, who stations himself at the nearest wayside telephone booth in advance of the equipment. By so locating himself, the conductor is in constant touch with the despatcher's office and is in a position to direct the engine crew to clear the track if the necessity for this should arise, and then to notify the despatcher's office when the equipment is in the clear. The conductor also warns the ballast cleaning crew of the approach of passenger trains on the track adjacent to the operating side of the machine, and as a special safety precaution, the operation of the equipment is suspended while the trains are passing. This is true also in the case of freight trains passing on the operating side of the equipment, but there is no suspension of the work for the passing of either freight or passenger trains on the track back of the machine.



The Complete Ballast Cleaning Equipment as Used on the Pennsylvania

Operated Two Shifts Daily

Following the practices outlined, the ballast cleaning machine operates continuously through the two eight-hour shifts of the daytime, this being done to secure the greatest return from the equipment by keeping it in operation as much of the day as is possible, and at the same time, to reduce the number of runs to and from the terminal at which the equipment ties up. When the work for the day is completed, the equipment is dressed for road haul, the locomotive is coupled into the train, and the complete outfit returns to the terminal for the night. At the terminal the conveyors on the loaded dirt cars are transferred to a waiting string of five empty cars, the loads of refuse are set out, and the machine is turned over to a mechanic and a helper who, during the night, make a complete running inspection of each unit of the equipment, oil all bearings, and put the machine in condition for operation the following day.

Transferring the belt conveyors from the loaded cars to the empty cars is accomplished by means of the pillar crane at the rear end of the screen car. This crane can be raised and lowered, and its horizontal boom can be swung out to either side. In actually transferring the conveyors where only two parallel yard tracks are available, the loaded cars are pushed in on the same track with the empty cars, and then, operating on the adjacent track, the ballast cleaning machine with its crane picks up one conveyor at a time, and then moves backward and places it on one of the empty cars. Where three parallel yard tracks are available, the work of transferring the conveyors is somewhat simplified, as in this case the ballast cleaning machine can pass between the loads and empties and merely lift the conveyors sidewise from one set of cars to the other. The refuse removed from the ballast in the cleaning work has all been moved to Altoona, Pa., and used in the grading of additional yard facilities at that point.

Over a Mile of Ballast Cleaned Each Day

The actual work of cleaning ballast on the Pennsylvania with the new Brownhoist equipment was started on June 15, on the four-track territory just west of Huntington, Pa., on the Middle division. Until the first of July the work was almost entirely experimental, and in fact much experimental work was carried out during July, although 111,105 ft. of track was cleaned during that month. Beginning August 1, the ballast cleaning force began to find its stride, and the records show that in the 23 days that the equipment was worked in the month a total of 161,370 ft., or about 30.1 miles of track was cleaned. Further analysis of the records shows that for the

23 days worked, the first shift each day cleaned an average of 3,424 ft. and the second shift an average of 3,601 ft., which gives an average of 7,025 ft. or 1.3 miles a day for each of the working days of August. This average output of the equipment during August was accomplished in actually working only about 40.5 per cent of the total time each day, the remainder of the time being employed as follows: Running to and from the site of the cleaning work, 21.5 per cent; repairs to equipment, 13.5 per cent; shifting cars, 13 per cent; delays due to traffic, 11.2 per cent; and miscellaneous interruptions, 0.3 per cent. Of the eight days of August in which the ballast-cleaning equipment was not in use, four were Sundays, and in the other four days the equipment was tied up because of generator trouble.

During September, in which the equipment was employed 24 days, the average daily rate with which the work was completed was 6,326 ft., or about 1.2 miles. The total length of track cleaned during the month was 151,820 ft., or about 28.7 miles. In October, up to the 20th, when the equipment was moved from the Middle division, the average amount of track cleaned a day amounted to 7,824 ft., which is a considerable improvement over the performance in either August or September, when the daily average amounted to 7,025 ft. and 6,326 ft., respectively. Excluding the first two Sundays in October up to the 20th, the equipment worked a total of 17 days, in which time the total track cleaned amounted to 133,000 ft., or about 25.2 miles.

Careful Records Made of Operation

All of the work of the ballast cleaner on the Pennsylvania until October 20 was on the Middle division, east and west of Huntingdon, Pa., and east and west of Lewistown, and the total length of intertrack space cleaned up to that date amounted to 107.3 miles. Throughout all of this work the outfit was operated under the jurisdiction of the division superintendent on the Middle division, and careful records were maintained, not only of the amount of work accomplished each day, but of every detail in connection with the operation of the equipment. These records were made daily by track supervisor's clerks who accompanied the equipment, and included an accounting for every minute from the time the equipment left the terminal in the morning until it was back in the terminal at night.

As a result of a study of these records and the actual work performed by the ballast-cleaning equipment, it is felt that the new equipment has proved itself both effective and economical, with certain advantageous features of importance. Among these are the speed with which the work is accomplished, the small force required to operate the equipment, and the neatness with which the cleaned ballast is returned to the track. Another most important advantage of the new equipment is that it operates effectively in wet weather as well as in dry weather, it having been estimated that, even under the more unfavorable conditions, 95 per cent of the refuse is removed. Difficulty in thoroughly cleaning the ballast has been encountered only where the ballast is unusually wet and muddy.

This equipment is being operated by the Pennsylvania under lease from the Industrial Brownhoist Corporation, Cleveland, Ohio. We are indebted to William Elmer, special engineer on the Pennsylvania, for the operating details contained in this article.

Railroads Award Prizes

SUPPLEMENTING the reports issued by three railroads covering the awards of prizes following their annual track inspections, published on page 539 of the December issue, we present below, summaries of the results of annual track inspections on five other railroads, namely, the Canadian Pacific, Eastern lines; the Hocking Valley; the Lehigh Valley; the Pere Marquette; and the Richmond, Fredericksburg & Potomac. Further reports will follow in subsequent issues.

C. P. R. Eastern Region Rewards Foremen

Sixty-four foremen on the Eastern region of the Canadian Pacific were awarded prizes totaling $1,000 as a result of proficiency in carrying out their work during 1928. On this road it is the practice to award a general manager's prize of $100, 4 general superintendent's prizes of $50 each, 14 division superintendent's prizes of $25 each, and 45 roadmaster's prizes of $10 each. In judging the various sections on the region, each section is rated on its physical condition and the quality and character of the work done throughout the year, due consideration being given to the man-hours consumed and the expense incurred. In determining the winners, the general manager selects the winner of his prize from the four sections winning the general superintendent's prizes; the general superintendents select the winners of their prizes from the 14 winners of the superintendent's prizes; and the superintendents select the winners of their prizes from the 45 winners of the roadmaster's prizes.

The general manager's prize for 1928 was won by E. A. Kimball, Seeboois, Me., on the St. John subdivision, Brownville division, New Brunswick district, while the four general superintendent's prizes were awarded to the following foremen: M. Chase, Nixon, N. B., on the Shogomoc subdivision, Woodstock division, New Brunswick district; A. Coates, Lennoxville, Que., on the Megantic subdivision, Farnham division, Quebec district; W. Kittlewell, Carley, Ont., on the Mac Tier subdivision, Bruce division, Ontario district; and R. Beaupre, Missanabie, Ont., on the White River subdivision, Chapleau division, Algoma district.

Hocking Valley Holds Thirty-third Inspection

The thirty-third annual inspection of all main line tracks of the Hocking Valley was held on November 26 and 27, 1928, and, following the custom of the past two years, the inspection combined the mechanical tests for low joints and cross levels with the inspection by a small party of officers covering line, policing and general order, ballast and ditches, and ties and crossings. The general averages or ratings for each foreman's section and each supervisor's subdivision was determined by assigning the following weights to the various items covered in the inspection: Line, 2; policing and general order, 2; ballast and ditches, 1; ties and crossings, 1; low joints, 3; and cross levels, 1.

With averages thus obtained, prizes of $100, $75 and $50 were awarded to the supervisors whose districts received the first, second and third highest ratings on the railroad. Similarly, the section foremen whose sections were given the first, second and third highest grades on each supervisor's district, received prizes of $50, $25 and $10 respectively. The

winning supervisors were: F. A. Mathews; district No. 3, with headquarters at Columbus, Ohio; F. A. Dirnberg, district No. 1A, Walbridge, Ohio, and F. H. Sparks, district No. 2, Marion, Ohio. Mr. Mathews was the winner of the third prize two years ago while Mr. Sparks won the first prize two years ago and the second prize last year.

Lehigh Valley Announces Results

While no prizes are awarded on the Lehigh Valley as a result of the annual track inspection, a careful inspection is made, and each division, supervisor's territory and section on the road is carefully rated, so that the results can be published and distributed among all of the maintenance forces. In arriving at the ratings given, each class of maintenance work is rated separately, a definite percentage being assigned to each class.

As a result of the 1928 inspection, which was made on the above basis, the Buffalo division, of which E. J. Cullen is division engineer, received the highest rating, 99.57 per cent. The second highest rating on the system was given to the New York division. A. M. King, division engineer, with 99.54 per cent, while the third highest rating, 99.53 per cent, was given to the Wyoming division, of which F. N. Loughnane is division engineer.

The results by subdivisions gave E. F. Dinan, supervisor on the New Jersey & Lehigh division, the highest rating of 99.60 per cent; W. F. Nichols, supervisor on the Buffalo division, the second highest rating of 99.58 per cent; and B. F. McGuire, another supervisor on the Buffalo division, the third highest rating of 99.56. All of the ratings given the winning divisions and subdivisions for 1928 are higher than the ratings given to the winners in 1927, and the total average rating for the entire system for 1928 was established at 99.52 per cent as compared with an average rating of 99.25 per cent in 1927, and 99.22 per cent in 1926.

Awards on the Pere Marquette

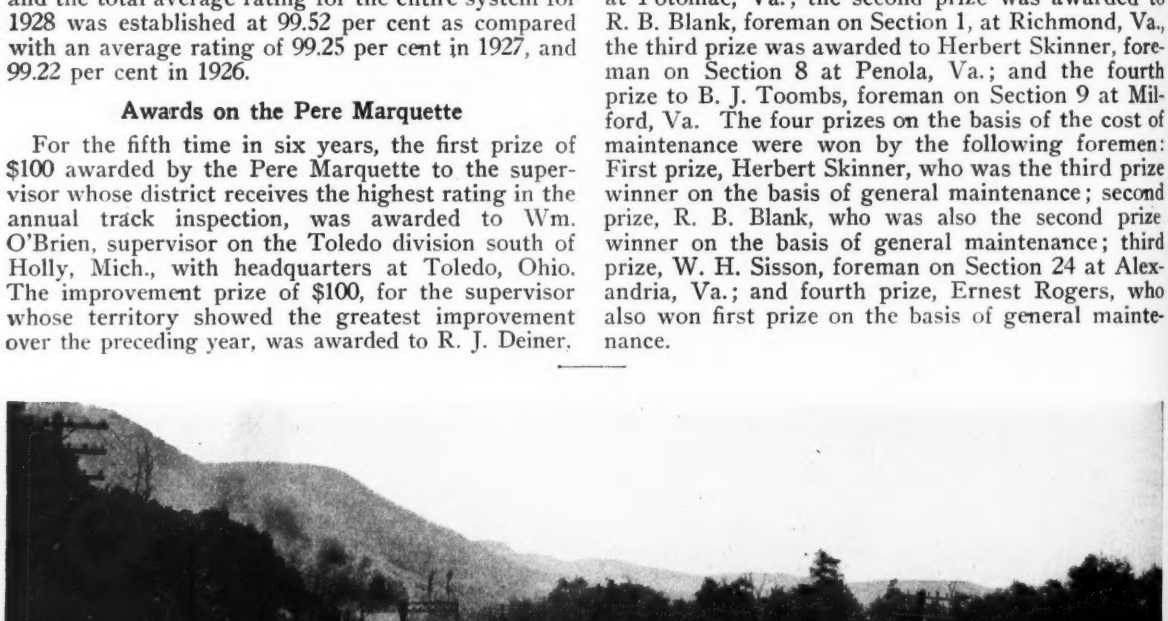
For the fifth time in six years, the first prize of $100 awarded by the Pere Marquette to the supervisor whose district receives the highest rating in the annual track inspection, was awarded to Wm. O'Brien, supervisor on the Toledo division south of Holly, Mich., with headquarters at Toledo, Ohio. The improvement prize of $100, for the supervisor whose territory showed the greatest improvement over the preceding year, was awarded to R. J. Deiner, supervisor on the Port Huron division, with headquarters at Saginaw, Mich. The Toledo-Ludington division, of which H. J. Bogardus is division engineer, was again successful in receiving the highest rating given to any division.

In addition to the supervisors' prizes, prizes of $25 each were given foremen on each of 13 supervisors' subdivisions whose sections received the highest grade and also to a foreman on each of 12 districts, whose section showed the greatest improvement during the last year.

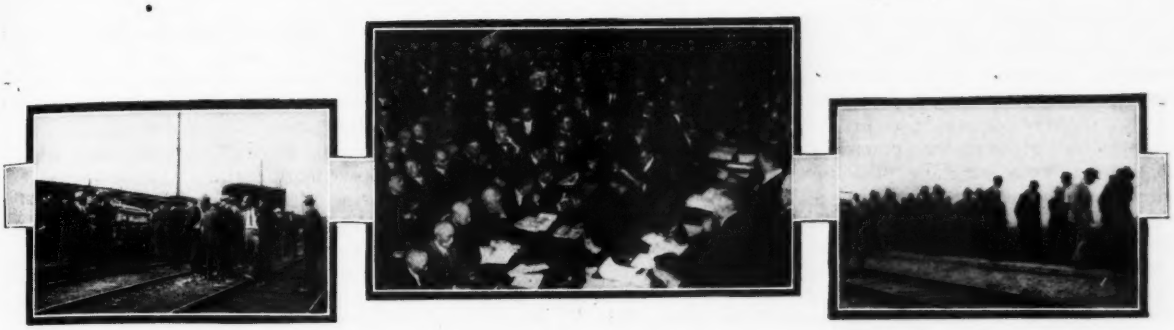
R. F. & P. Awards $560 in Prizes

As a result of its annual track inspection, the Richmond, Fredericksburg & Potomac again made eight prize awards to its section foremen, or section masters as they are called on that road, totaling $560. In the practice of the Richmond, Fredericksburg & Potomac there are two sets of four prizes each, the first set being awarded solely on the basis of the physical characteristics of the track, as rated by a committee of judges, and the second set being awarded on the basis of the cost of maintenance. In arriving at the winners of the second set of prizes, the annual cost of maintaining each section is divided by the rating given each section by the judges, which produces a definite cost per point of rating for each section. The four section foremen whose sections have the lowest cost per point of rating are awarded the second set of prizes. The four prizes in each set of awards are $100, $80, $60, and $40 respectively.

As a result of the 1928 inspection, which was held on December 7, the first prize on the basis of general maintenance, was awarded, for the second consecutive year, to Ernest Rogers, foreman on Section 25 at Potomac, Va.; the second prize was awarded to R. B. Blank, foreman on Section 1, at Richmond, Va., the third prize was awarded to Herbert Skinner, foreman on Section 8 at Penola, Va.; and the fourth prize to B. J. Toombs, foreman on Section 9 at Milford, Va. The four prizes on the basis of the cost of maintenance were won by the following foremen: First prize, Herbert Skinner, who was the third prize winner on the basis of general maintenance; second prize, R. B. Blank, who was also the second prize winner on the basis of general maintenance; third prize, W. H. Sisson, foreman on Section 24 at Alexandria, Va.; and fourth prize, Ernest Rogers, who also won first prize on the basis of general maintenance.



East Approach to Gallitzin Tunnel on the Pennsylvania



Why Maintenance of Way Men Get Together*

The place of the national and local associations and what they can accomplish

By H. R. CLARKE

General Inspector of Permanent Way, Chicago, Burlington & Quincy, Chicago

THE organizations suggested to our minds by the subject of this paper are the two national bodies, the Roadmasters and Maintenance of Way Association and the American Railway Bridge & Building Association. The local organizations are the International Track Supervisors Club of Buffalo, the Metropolitan Track Supervisors Club of New York and the Maintenance of Way Club of Chicago.

Why Were They Organized?

Why were these groups organized and why do they continue to meet? The answer is, for the pleasure and profit of their members, pleasure in meeting men of mutual interests and profit in discussing with them common problems and so becoming better qualified to handle the duties assigned to them. It is an accepted fact in all lines of activity and effort that there is no more certain method of arousing and maintaining interest and no quicker way of getting information and increasing knowledge in regard to any subject than by getting together groups with mutual interests for conference and discussion. The almost numberless associations maintained by all kinds of organizations, professional, technical, religious and social, is evidence of this. So we get together in order that we may become better and more efficient maintenance of way men by the quickest and surest method of bringing this about.

Any man so unfortunate as not to have a keen interest in his work, who cannot feel that his job is an important and essential one, who approaches his daily duties in any other spirit than one of zest and enthusiasm, eager and anxious to get at it, is working under a handicap. This holds good, regardless of what the work may be, laying rail, building bridges or the routine of the executive's desk.

Maintenance of way men are at a disadvantage compared with those of many other departments in that they are scattered and isolated and do not have opportunity to get together easily. The need for and advantage of meeting the other fellow who has the same troubles as we do, the inspiration and encouragement obtained in mixing with our co-workers, give ample reason for making a special effort to get together occasionally. What maintenance officer is not familiar with the stone wall of indifference and lack of interest he encounters when he proposes some new or different practice and has to do it by letter or even by talking with individuals? The fact that men in the maintenance department are scattered and seldom get together in groups is one of the important factors that render it difficult to make the same showing in such matters as safety performance that other departments can turn in. We are all familiar with the change that can be brought about and what can be accomplished if men are brought in for a general discussion. I have seen foremen come to such a meeting in a disgruntled frame of mind, grumbling and dissatisfied, and go away with their chests out, feeling that they had a big job to do and that they were just the men to handle it. It may be psychology but it holds good, regardless of rank or place.

What They Can Do

To a man interested in his work, there is no greater pleasure or encouragement than in meeting others interested in the same thing, alive to its possibilities and working out together the common problems. Our associations are hard-working organizations of practical men with a very definite objective. Their purpose is to present to their members some of the problems, questions and difficulties encountered in the maintenance of the railroads of America and, if possible, offer solutions of the problems and means of overcoming the difficulties. These are their primary aims and those toward which they work directly. There is, in addition, a secondary or indirect objective. That is membership in our associations and attendance at the conventions. Engaging in the work of the organizations presents an opportunity to realize the vital part that transportation plays in the welfare of the country and to see and

* A paper presented before the Maintenance of Way Club of Chicago on December 19, 1928.

know the important place that maintenance of way and structures has in that great industry; so, in getting together, we maintenance of way men learn that we have no small job and are encouraged accordingly.

Our conventions are not joy-riding or sight-seeing excursions. Holding our conventions in various cities of the country is for the explicit purpose of stimulating interest in the associations in the different sections and to allow men to attend who might not be able to reach more distant points. Most of our members take advantage of the opportunity afforded by the trip to observe and profit by what they see on some foreign line. The reports made and suggestions offered by the roadmasters and master carpenters of my own road are proof of this. I am still explaining why we cannot do some of the things and follow some of the practices that they have noticed on other roads. So, maintenance of way men meet in order that they may be more valuable to the railroads they serve and to themselves, for the pleasure and profit there is in meeting fellow workers and the mental stimulation there is in exchanging ideas and information.

What place have these organizations among the professional associations in the railroad field? What can they accomplish? I can say without hesitation that anyone who has worked in our associations or in any way interested himself in the work they are doing is convinced that there is a very definite place, a clean-cut, well-defined work for them to do in the railroad maintenance field. That place and work are: Furnish a meeting ground and afford opportunity for the maintenance supervisory officers to get together, and, in working out their common problems, become better and more efficient maintenance men, more useful to their companies, with more pride in their work and more confidence in their own ability to do it.

Because of being so scattered, as was previously suggested, it is more difficult for maintenance men to meet in small groups to discuss their problems than it is for men in some other lines of work. Business men have their weekly noonday luncheons, not only in large cities but in every village, a practice utterly impossible for maintenance men. This further justifies the Roadmasters' and the Bridge and Building associations, because without some such groups, men in these lines of work would seldom or never have opportunity to hear men, working in like capacity and under similar conditions, discuss their common problems. For this reason alone, these organizations justify themselves.

The Personnel of the Association

Consideration of the membership of our organizations makes very clear and definite the place these associations have and the field in which they work. The majority of the members of the Roadmasters' association are roadmasters and supervisors. It also includes, of course, members of other ranks such as general roadmasters, division engineers, etc. Many, in fact most of these latter group, are men who became members of the association while still roadmasters or supervisors and have since been promoted. That they have continued to work in the association speaks well for the place it fills. We also have as members a few men of system rank such as engineers maintenance of way. Some of these men take a keen interest in the work of the association. The membership of the Bridge and Building association is of much the same character, although possibly a little more diversified. It consists largely of master carpenters, bridge supervisors, water-service foremen and engineers, with perhaps a larger percentage of members of a somewhat higher rank than is the case in the Roadmasters association. This makes it plain that the place and the work of our associations is among maintenance officers of supervisory rank. There is no conflict of work between the two associations nor with any other technical associations.

How do the associations work? Like all other such organizations, these two work through committees, the committee reports being clarified, explained, curtailed or enlarged by free discussion on the floor of the convention. Sometimes the discussion is fully as valuable and instructive as the original report, possibly more so. The programs are amplified by papers or addresses by men of rank and recognized accomplishment in railroad work. The more active a member is and the harder he works in the association, the more he gets out of it.

What Do They Do?

With what problems and questions do our associations deal? A review of the programs of the associations for the past few years clearly shows the matters they consider and discuss. The reports are on live, pertinent and up-to-date subjects. The work our members direct and oversee is of a technical nature. So we have reports dealing with the care of winter-laid rail, shipping and handling ties, joint maintenance, the workmanlike laying of rail, proper methods in renewing ties, etc.

Fully as important as the technical side of our work is the human side. Our members must know not only how to handle rail and ties, piling, concrete and bridge steel, but also, and even more important, they must know how to care for and handle men. So we have reports outlining safe methods of handling our work, the prevention of personal injuries, etc., and other reports on the even more difficult and intangible subject of the handling of men, as in the reports dealing with such subjects as the selection and training of foremen.

Our members are directly on the firing line in the fight of the railroads against natural forces and accidents such as floods, fires, snow, sleet, wind and derailments. So we have reports dealing with the organization and methods necessary to contend with and conquer these opponents.

Of what use are these reports and discussions? What do they accomplish? There are two ways by which we learn, first, from our own experience, second, from the experience of others, intelligently presented and carefully studied and considered to determine in what way it may be of use to us.

The first method is slow, tedious and sometimes painful. If it were the only one, the world would still be in the dark ages. It is by taking advantage of the experience, knowledge and accomplishment of others and adding to the experience, increasing the knowledge and improving the accomplishment that civilization advances. Our reports and discussions do just that for us. The solution of a problem someone else has worked out and presented to us in a committee report or in discussion on the convention floor very often shows us a way out of some difficulty we are in or suggests a plan to use in handling work that may be a little out of the ordinary for us. Several times within the past two or three years our maintenance men have asked permission to try some idea they had heard suggested at a convention they had attended. At present, our engineer of tests and general supervisor of welding are working on a suggestion made at the Detroit convention and I am waiting for their report before making final recommendation to our vice-president. A report dealing with safety and the prevention of personal injuries in the maintenance of way department, made two years ago, resulted in important changes in the instruc-

tions and practices. At least one suggestion made at Minneapolis a year ago was adopted by our engineer of buildings. If some idea or plan has been found unsuccessful, information to that effect often saves valuable time. We learn where and why it failed and can begin at once to work out another solution. We do not waste either time or money on a scheme someone else with conditions similar to ours has found a failure.

Knowing that the other fellow has his troubles, sometimes makes our own appear smaller. It may be that "misery loves company" but we know the result anyway. Hearing of success achieved spurs and drives us on to fresh effort if we are discouraged and ready to give up.

The Place of the Other Associations

Affiliated with our association are organizations of track, and bridge and building supply men. They bring to our attention new and improved materials and appliances and offer valuable assistance in using these successfully. The exhibits of the supply associations displayed at our annual conventions are an important part of the activities and add greatly to the interest and value of the conventions.

The work of the local associations is not on as large a scale as that of the national bodies, but they meet more frequently and furnish a gathering place for men with common ideas and mutual interests, and so there is the element of fraternity and pleasure already spoken of. Many of the talks we have are valuable from an educational and instructive standpoint. The work of the local associations supplements that of the national, and perhaps the most valuable contribution they make is in keeping interest and enthusiasm alive throughout the year.

The greatest problem of any group meeting is to make an impression so strong and lasting in the minds of those who attend that they will retain their enthusiasm long enough to take it home and put it into practice. Vision must be transformed into action to make the vision worth while. It often happens that when men affiliate themselves with our associations they obtain a broadened conception of what it means to be a maintenance man. They realize that they do not face their problems alone but that they are a part of a large number, scattered from east to west and north to south. They are encouraged by meeting with their co-workers. But when they go back to their work, the other fellow is forgotten, broadened vision is lost, enthusiasm cools, interest dies and they are lost to our associations. Their own loss, however, is greater than ours.

If our associations are to grow and be of value, they should be of value to us as individuals and to the railroads which employ us. Our new members must become old members and derive from our annual meetings an enthusiasm vital enough to last till they meet a fellow worker and enlist him as a member. There is always strength in numbers.

What Are Their Weak Points?

Where do our associations fail? What are their weak points?

1. They fail in that they do not cover their fields more completely. By that, I mean the membership is not as large as it ought to be. A very large number of men, eligible to membership, who would profit by working in the associations and be of value to the associations, are not affiliated with us.

2. They fail in that they are not able to hold the interest and loyalty of members once enlisted. Men drop out, and the loss is both ours and theirs.

3. They fail in that it is difficult to get men to work on committees. Assignment to a committee is an honor and a tribute to what a man has accomplished. We think he can contribute something of value and worth to his fellows. If he fails to work, the honor is an empty one.

4. They fail in that they cannot encourage or compel a larger number of members to engage in discussion on the floor. Make note of those speaking on the various matters and see how often the same name appears. This is not a criticism of those who do speak. They do it to assist and to encourage others.

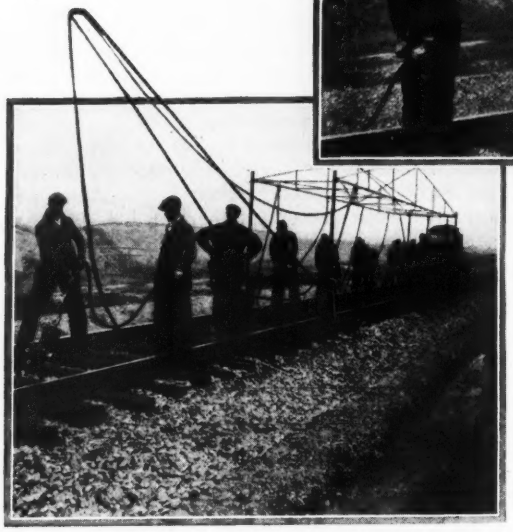
It is those who do the work that get the most out of our associations and conventions. They are the enthusiasts, eager to continue to carry their share of the load and determined to be present at the conventions. The officers and directors of the associations know these points of weakness and failure; I am saying nothing new. I am merely indicating that, valuable and useful as our associations have been and are, there is plenty of hard work yet ahead.

I am afraid there is an idea, at least in some quarters, that the Roadmasters' and the Bridge and Building associations are unnecessary, that they overlap, conflict with and duplicate the work of the American Railway Engineering Association. Those who are best informed and most familiar with the work and the field of the three associations are most sure that this is not the case. There is some small duplication in membership, that is, a few members of the Roadmasters' or the Bridge and Building associations are also members of the A.R.E.A. A few are members of both the Roadmasters' and the Bridge and Building associations and still fewer are members of all three. The number of such cases is limited and occurs only where a man is very definitely interested in the work the associations are doing and feels positively that he will be benefited by belonging to and working in more than one association.

The work of the Bridge and Building association and Roadmasters' association supplement each other, but their fields are separate and there is no duplication. This is even more true in the case of the A. R. E. A. The work is very different. In the A. R. E. A. it is more technical and professional and appeals to the system officer or the specialist. Our associations and the work we do appeal to the man on the firing line, dealing with the immediate and urgent problems of keeping the line open and maintaining the property to the desired standards with the minimum expenditure. They touch more directly the handling of men, involving not civil, mechanical or electrical engineering but the more complicated and vital human engineering. Such are the place and the work of our associations.

Car Ferry of the Gulf Coast Lines, Missouri Pacific System, at Baton Rouge, La.

Two Views of the Spiking and Bolt Tightening Gang



Overhead Air Su
Aids Use of Po

Piping rig supported on wheel speed wrenches, spike pullers and drive

AN INGENIOUS facility for increasing the effectiveness of power tools in rail-laying work was developed on the Marion-Chicago division of the Erie during the past season. Plans had been prepared for setting the new rails in place with a locomotive crane and to equip the "steel" gang with a full complement of pneumatic spike pullers and spike drivers as well as pneumatic wrenches for running nuts on and off track bolts, together with the necessary compressors to supply air to the tools. Based on previous experience with equipment of this type, serious consideration was given to the possibility of expediting the work by some device that would deliver the compressed air to the tools from the compressor in a more convenient way than by dragging the air hose along the track. This resulted in the development of the portable air-pipe rig shown in several of the illustrations.

This rig consists of two trusses, 40½ ft. long, made entirely of wrought pipe with welded joints. The top chords, web members and cross bracing are made entirely of ¾-in. pipe, while the bottom chords are of 1¼-in. pipe, which, in addition to structural use, serve also as compressed-air conductors, as they are equipped at 9-ft. intervals with standard tees, together with nipples, brass cocks and hose couplings to provide the take-offs for the delivery of air to the tools. A transverse pipe, connecting the two bottom chords at one end of the trusses, provides the necessary facility for the air-hose connection to the compressor.

These two trusses are supported at each end at a height of seven feet above the rails by bents consisting of two 2-in. pipes which, together with suitable knee-braces, are secured to a truck made up of pieces of 9-in., 15-lb. channels and a 2½-in. by 3-in. by ¼-in. angle tie. Motor-car wheels and axles are mounted in the trucks.

This truck-mounted frame, coupled in front of a truck-mounted, self-propelled air compressor, forms a complete portable compressor air plant from which the air can be supplied to hand tools. It can be moved forward along the tracks at whatever speed is most suitable for the character of the work being done. As shown in the photographs, this device was used on the Erie as a utility for both spike pulling and spike driving, and it was found that the three or four operators employed could keep close enough together in their work so that 10 ft. of hose connecting the tools to the air-supply pipes, allowed ample leeway. As seen in the pictures, this resulted in very little dragging of the hose on the track.

Boom Provided for Bolters

On the frame provided for the spiking gang, a 20½-ft. boom made of two 1¼-in. pipes was attached to the forward end, with two ⅜-in. cables extending from the tops of the forward posts to the top of the boom so that the end of the boom was supported 10 ft. 6 in. above top of rail and 18 ft. 6 in. ahead of the front wheels. An air hose about 40 ft. long was run from a connection in the air-supply line over the end of this boom to serve as the air supply for the pneumatic wrench that was used for running up the nuts on the joint bolts. With this length of hose, the wrench operator had ample time to do his work at a joint without interfering with the progressive movement of the conveyor and compressor along the track to meet the progress made by the spikers.

The relaying operation carried out on the Marion-Chicago division of the Erie involved the replacing of 100-lb. A. R. A. Type-A rail with 110-lb. R. E. section rail, and as the widths of the bases are the same, only the outside spikes were pulled. The track was partly tie-plated under a program for tie plating whenever ties are renewed. Accordingly, no tie plate applications were made in connection with the rail renewal and all plates already on the ties were left in place. No work was done in advance of actual relaying except to distribute materials and hang angle bars on the ends of the rails.

The steel gang employed on this work consisted of

Spike Pullers at Work — At Left, How the Pipe Rig Was Coupled to the Compressor Car

Supply Frame Power Tools

speeds work of pneumatic drivers in rail laying

63 men, formed by combining section gangs, and included 8 section foremen. The equipment provided with this gang included the following:

Two pneumatic spike pullers, served by a four-tool tie-tamper compressor with a capacity of 88 cu. ft. of air per minute.

A locomotive crane for lifting the new rail into place. The crane hauled a push car on which spare fastenings and spare tools could be loaded and from which additional material could be distributed.

Four pneumatic spike drivers and two pneumatic wrenches, one used for running up nuts on the new rail and the other for turning nuts off the old rail. These six tools were served by an eight-tool tie-tamper compressor with a capacity of 160 cu. ft. of air per minute.

Organization of Rail Gang

Releasing Old Rail

2 men taking off old rail anchors
6 men pulling spikes with claw bars
3 men operating pneumatic spike pullers
1 compressor operator with spike pullers
7 men barring out old rail

Preparing Ties

5 adzers
2 men plugging spike holes

Setting New Rail

6 men lining rail into place
1 locomotive crane operator

Track Fastenings

2 men picking up and redistributing spikes
10 men setting spikes
4 men applying bolts
1 man starting nuts on joints in old rail
2 men unbolting old rail with air wrench
2 men running up nuts on new rail with air wrench
3 or 4 men operating spike drivers
1 or 2 men in reserve to operate spike drivers
1 compressor operator with spike drivers and pneumatic wrenches
1 man tightening bolts
5 men applying rail anchors

66 total

The typical organization of the rail laying gang is given in the table. This was supplemented by a signal crew of six men applying rail bonds to the new rail and removing them from the old rail.

The smaller compressor serving the spike pullers had insufficient capacity to serve more than two spike pullers, who were unable to keep up with the progress in the other units of the work. If two more spike pullers could have been employed, it would have been possible to eliminate most of the men employed in pulling spikes with claw bars. Five men were assigned to the spike drivers and four machines were available, but experience showed that approximately the same progress was made when three of the machines were operated, with two men in reserve to alternate with the other three, as when four machines were operated with only one man in reserve.

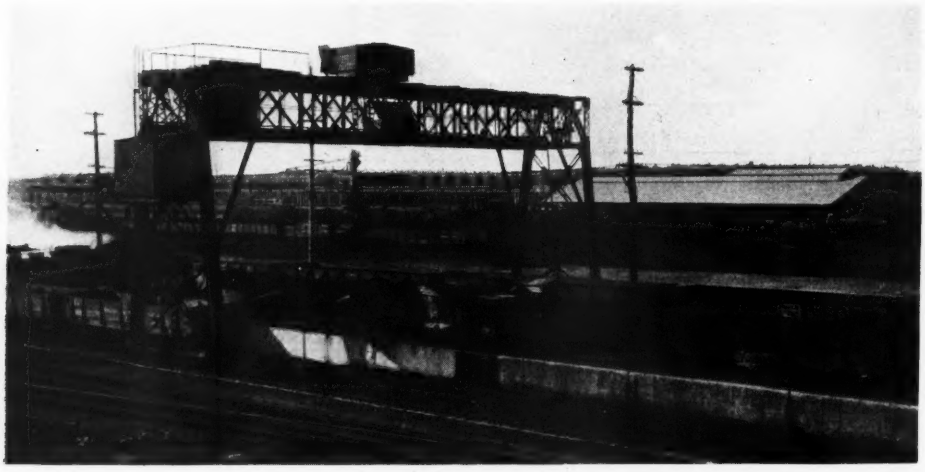
The organization of the gang, as given in the table, was modified from hour to hour as conditions required. If corroded spike heads slowed up the work of pulling spikes, some of the men setting spikes were moved ahead to speed up the spike pulling. Conversely, if the spike pulling advanced too fast, some of the clawbar men were assigned to other operations. With the organization and equipment described above, 34,599 track ft. of rail was laid in two days with an average working time of 9½ hours per day, including the time traveling.

The power equipment, with the exception of the locomotive crane, was of Ingersoll-Rand make and

Statement of Rail Laying for Two Consecutive Days

	First Day	Second Day	Total 2 days
Total number, trackmen	56	55	111
Man-hours time worked	518¼	533	1,051¼
Total number, track foremen	8	8	16
Man-hours time worked	76¼	79½	155¾
Total number, machine operators	3	3	6
Man-hours time worked	34	34	68
Total lineal feet of rail laid	17,280	17,319	34,599
Average feet of rail laid per man-hour of time worked	27.5	26.6	27.1
Average number of feet of rail laid per man-hour for actual time worked for 2 days exclusive of the labor applying rail anchors and unbolting old rail			30.5
Average feet of rail laid per man-hour including traveling time	25.0	24.5	24.8

was used in this work with the approval of J. C. Patterson, chief engineer maintenance of way of the Erie. The development of the pipe delivery frame was carried out under the direction of H. D. Row, division engineer of the Marion-Chicago division, under whose general direction the rail laying was done. A. Burgett, supervisor, Huntington, Indiana, was in immediate charge.



The Magnet-Equipped Gantry Crane at the New Roadway Store

Below—A View of the Old Scrap Dock and Ground Storage Area Covered with Maintenance Material

Consolidated Roadway Stores Insure Prompt Deliveries

Boston & Maine combines plants at seven scattered points with large economies and better service to the using department

AFTER maintaining separate maintenance of way stores on its various divisions for many years, the Boston & Maine undertook the consolidation of these stores in 1926, with the view of effecting economies in the stores department and of giving better service to the various branches of the using department. This consolidation was completed in March of this year, and the smoothness and economy with which the new arrangement has worked since that time, from the standpoints of both the maintenance of way and the stores departments, have convinced both of these departments of the merits of the new plan.

Under the old arrangement, on the Boston & Maine, which has a total of 2,082 miles of lines, there were seven maintenance of way division stores, located at East Somerville, Mass., Fitchburg and Salem, Concord, N. H., Nashua and Woodsville, and Lydonville, Vt. At each of these points, separate maintenance of way storehouses were maintained under the jurisdiction of a maintenance of way division storekeeper, who had under him the necessary supervisory, clerical and labor forces to carry out the work of ordering, storing and distributing supplies and materials. The store department forces on each division included from 6 to 10 employees, except at Salem, which for some time functioned as a general maintenance of way store, where there were about 20 employees. Under this arrangement, all orders for materials required by division forces were drawn on the division storekeepers, whose jurisdictions extended over not only the materials at their respective store headquarters, but also over all unused materials located on their divisions.

For several years the storehouse at Salem functioned as a general maintenance of way store, and at this point stocks of lumber, piling, switch ties, track materials and miscellaneous maintenance of way supplies were kept on hand for all division requirements, the division stores drawing on the stock as necessity arose. This arrangemen of scattered stores facilities seemed to offer certain advantages, primary among which was that of having supplies close to the points of consumption, but on the other hand, it entailed a number of distinct disadvantages.

At each of the division stores the supplies and materials were stored in buildings, sheds and car bodies at more or less widely separated locations, which did not

permit the efficient or economical handling of materials, regardless of diligent efforts at good housekeeping through the medium of proper racks, careful classifying and storing, and a general attempt to keep the facilities in first class condition. The speed with which orders were filled and despatched also suffered in many instances, because they could not be filled at the division stores and had to be forwarded to the main store at Salem for attention; and furthermore, because without suitable and adequate material-handling equipment at each of the division stores, the loading of the heavier materials took considerably longer than would have been required at a well-equipped general store.

Consolidation Occupied Over Two Years

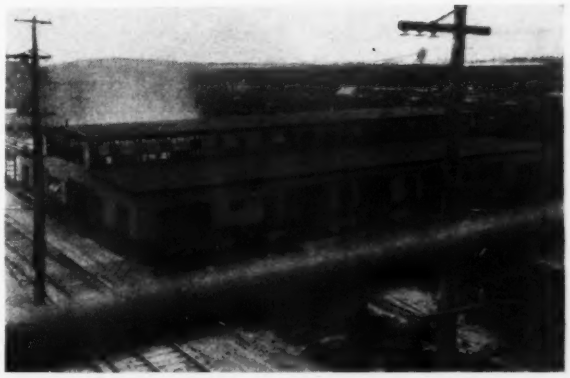
The first step in the consolidation of the maintenance of way stores facilities, although not recognized as such at the time, occurred in 1926, when the Boston & Maine turned over to the Canadian Pacific and the Quebec Central, respectively, the most northerly portions of its lines extending into Canada, from Wells River, Vt., to Newport, Vt., and from Newport to Sherbrooke, Que., a total distance of about 103 miles. At that time it abolished its division store at Lydonville, located on the lines released, and the remaining territory served by this store was divided between the stores at Woodsville and Fitchburg.

The second step in consolidating its maintenance of way stores came in the latter part of that same year with the enlarged activities of a new timber seasoning and treating plant at Nashua. This plant, which was opened in 1925, was used at first entirely for the treating of ties, but in the latter part of 1926 a start was made in the treating of bridge timbers. This was followed in 1927 by the equipping of the plant for the framing and treating of all classes of bridge and building timbers,

Old Reclamation Plant Building Is Used for Maintenance Stores

and by the installation of a resawing and planing mill. With this development, all division supplies of dimension timber and crossing plank were transferred from the general store at Salem to the treating plant.

In the spring of 1927, with the consolidation of the division forces of the Worchester, Nashua and Portland divisions with the three main divisions of the road, the Portland, Southern and Fitchburg divisions, further consolidation of the maintenance of way stores took place. At that time the maintenance of way store at



A View of the New Reclamation Building

Nashua was abolished and the work of this store was divided between the stores at Concord, Salem and Fitchburg. At that time also plans for the general consolidation of the maintenance of way division stores was given considerable study, and special consideration was given to one plan in particular, whereby the entire road would be served by two large, well-equipped system stores. Owing to the cost involved, this plan was finally abandoned in favor of one providing for one general system store.

Consolidated Store at North Billerica

This plan for one consolidated store brought forth both favorable and unfavorable criticism. One of the main problems involved was the proper location of the consolidated store, but after a careful survey of all possible locations, this was solved in the selection of North Billerica, Mass. A number of factors entered into the selection of this point, which is about 23 miles northwest of Boston on the main line of the Southern division. The principal reason for the selection of North Billerica was the fact that the Boston & Maine already had modern store facilities at that point, together with all of the equipment necessary to handle materials and supplies expeditiously. This made it possible to locate at North Billerica with a decidedly smaller investment than would have been necessary at any other point on the road. In addition, North Billerica is the headquarters for locomotive, passenger-car, signal and miscellaneous materials and supplies for the system, and was the site of a large reclamation plant and scrap dock.

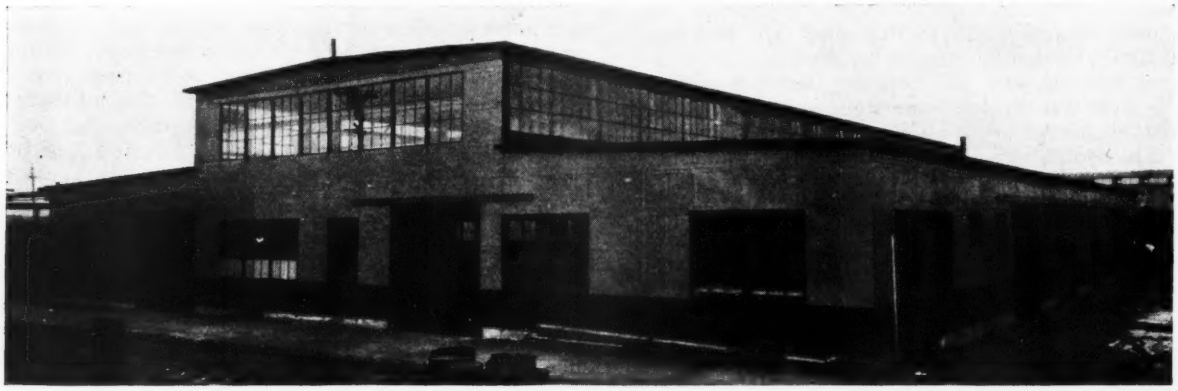
Having decided upon the location of the system store, a study was made of the facilities which would be required for it. As a result, it was decided to turn over the scrap dock and reclamation plant for the new maintenance store, and to lay out new and better adapted facilities for the reclamation of materials and the handling of scrap. Accordingly, a new reclamation plant was erected on available ground near the old reclamation plant and additional tracks were installed parallel with the scrap dock for handling scrap by locomotive cranes.

The new reclamation plant is a one-story, steel-frame structure of the high-low type, 124 ft. long by 96 ft.

wide, entirely enclosed with corrugated sheet metal and large areas of steel sash. With the completion of this plant in January of this year, all of the machinery, scrap and other materials at the old plant were moved into it, making the scrap dock and the old reclamation plant building available for the maintenance of way system store.

New Store Facilities Are Well Adapted

The scrap dock, which is served throughout its length by a track on each side, is a concrete structure of car-floor height, 637 ft. long by 44 ft. wide. At one end, the dock is occupied by the old reclamation plant building, which is a one-story frame structure, 337 ft. long by 28 ft. wide, while immediately beyond the other end of the dock, between the extended dock tracks, is a ground storage area about 237 ft. long. The full length of these new maintenance of way store facilities, including the dock and ground storage space, is served by an overhead gantry crane equipped with a magnet. This crane spans the dock and the service track on each side, so that the old scrap and reclamation facilities are admirably suited for the handling and loading of heavy maintenance of way materials.



The Reclamation Plant Building Has Large Glass Areas

By the time these facilities were made available, a rough survey had been completed of the maintenance of way materials which were to be transferred, and the manner in which they were to be arranged at the new store. On February 1, moving of the materials from the division stores began, the work being carried out from one division store at a time, according to carefully prepared plans so as to preclude the interruption of service to the maintenance department.

In the distribution of the materials released from the division stores, only those materials of a nature peculiar to the maintenance of way department were brought to the new general store. As arranged, all materials which should be protected from the weather, and all small or valuable materials were put in the stores building; switch stands, tie plates, joint fastenings, guard rails, and certain classes of useable scrap were stored on the scrap dock; and most of the heavier units of trackwork, such as frogs, switches, etc., were neatly arranged on the ground storage area. Supplies at the division stores, similar in nature to those carried by other departments, were consolidated, for the most part, with the similar supplies in the general storehouses, and finished lumber was stored in the lumber shed at Billerica. The final move in the consolidation program was effected early in March of last year, when the general storekeeper's office was transferred.

Although the consolidation of maintenance of way stores has been in full effect for only about nine months, many of the advantages and economies contemplated in the new arrangement have already become definitely apparent. In the first place, the fear that slower deliveries of materials would result has been completely allayed, for it has been found that with the new arrangement, orders are filled and despatched more promptly and much more economically.

This is due in part to the location of the store at North Billerica, which is within about 200 miles of the most distant point on the road, and also due in part to the larger force maintained at the central store, and the fact that, regardless of the hour, day or night, some of the store forces can always be reached on short notice to fill emergency orders. It is also due in part to the frequent train service from North Billerica, and in no small measure to the larger supply of materials at the central store than were formerly maintained at the separate division stores. This latter factor alone has in many instances reduced the time between the placing of an order and the receipt of the materials on the division, because under the new arrangement, the occasion does not arise when it is necessary for a division storekeeper to reorder materials from the system store.

Another factor of importance in the efficiency of the new store facilities is the material-handling equipment afforded, which includes, primarily, the magnet-equipped gantry crane, and the locomotive cranes, tractors, trailers and auto trucks of the general stores department which can be used in emergency to speed up the despatch of maintenance materials.

While this was the result hoped for primarily by the maintenance department, the stores department looked for many additional benefits in the new arrangement, which have been fully realized. In the first place, the centralized store brought about a marked reduction in the stores-department payroll. It has likewise increased the efficiency of supervision over the storing and handling of maintenance materials. It has brought about economy through the consolidation of accounts and through reductions in stock investment. It has eliminated switching operations and heating and lighting expenses at the stores abandoned, and it has made available for other uses, or for sale or lease, the buildings, tracks and land formerly occupied by the division stores.

We are indebted to O. A. Donagan, general storekeeper of the Boston & Maine, under whose direction the consolidation of stores facilities took place, for the information contained in this article.

"How Are We to Enlist the Loyalty and Enthusiasm of Our Employees?"

Safety in the Maintenance of Way Department

Two maintenance engineers point out many ways to minimize accidents among their forces*

By W. L. ROLLER and H. S. OSBORNE

IN A VERY true sense, the safety work in the maintenance of way departments of American railways antedates the present safety movement a great many years. It has been the continuing and ever-absorbing aim of the maintenance men to provide a good "factor of safety" in structures, equipment and roadbed over which his jurisdiction reaches.

With the rapid growth of population and the constantly increasing demand for transport of freight and passengers, has come a phenomenal and almost incredible increase in size and weight of locomotives and cars, while at the same time greater speed in the movement of trains has been demanded that the railroads might cope with their growing business. This constant change has involved study and research into the bearing power of soils and the ultimate strength of materials, such as wood, stone and steel. It has led to the development and further refinement of concrete, and has carried the engineer far afield in the realm of metallurgy.

The problem has always been one of economics as well as of safety, requiring the engineer to produce a safe result within certain economic limits. It should be the privilege as well as the duty of the engineer, through the knowledge he has acquired and will acquire, to provide better materials for railroad use and improved appliances for the execution of work.

There is a tendency often to cheapen the quality of materials which enter into the construction of railways, to compromise in the purchase of equipment and tools with which the work of the railroad is done and with which the worker has to work. Cheap or shoddy tools have been responsible for a large portion of the injuries to maintenance-of-way workers. It should, therefore, be the aim of those responsible for the maintenance of railroads to use every effort to find the tools best fitted for doing the work safely and then insist that they be purchased or otherwise provided. This is usually done by proper specification. The wholesome co-operation and co-ordination of the purchasing and using departments will go far to reduce the number of personal injuries among railway workers.

Mental and Moral Fitness of Men is Essential

There is another phase of safety work which, to my mind, far transcends the material phase. This relates to the mental, physical and moral fitness of the maintenance-of-way worker. The continued success and progress in safety work and the reduction in personal injuries will depend very largely on the mental and moral attitude toward the idea assumed by the railroad employee, whether he be in the shop, on the road, or elsewhere. Progress will be commensurate with the degree of enlightenment brought by the various agencies to the mind of the average worker as to the true aims and significance of the safety movement. The man who is mentally alert, wide-awake, interested and enthusiastic, rarely contributes to the personal injury record, but, on the other hand, is one of the greatest assets in the matter of accident prevention.

How are we to create this moral and mental attitude? How are we to enlist the loyalty and enthusiasm of our employees? How are we to arouse their undivided interest in the safety idea? I find the answer to this question in many of the activities which have already gained great headway on many of our railroad systems, namely, the organization of health and recreation de-

*Abstracts of two papers presented before the National Safety Council at its meeting in New York, October 2, 3 and 4. The first paper, on the general subject of safety in the maintenance of way department, was presented by W. L. Roller, engineer maintenance of way of the Hocking Valley. The second paper on the subject of motor cars was presented by S. H. Osborne, engineer maintenance of way of the Union Pacific.

partments through which employees and their families are encouraged to participate in wholesome social and recreational activities, and the publication of an employees' magazine for distribution throughout the whole railroad organization. Other activities such as the younger men's movements, having to do with the education of the younger men in the railroad organization in the solutions of problems relating to railroad operation and maintenance, are productive of a better degree of understanding and will go a long way toward creating and fostering the proper mental attitude toward the safety movement.

There are many ways of encouraging a more active interest and enthusiasm in the safety work, means by which the maintenance worker will know the company is interested in his physical and financial welfare. Better housing conditions, more comfortable quarters and more cheerful surroundings for maintenance of way workers temporarily denied the comforts of home, will be helpful in creating a spirit of cordiality and awaken the interest of the more aloof.

Another means is the elimination of seasonal employment as near as may be in the maintenance of way department. Much good may be accomplished by holding frequent get-together meetings of foremen for the discussion of mutual problems and to promote a closer contact between officers and men.

There are two schools of thought in relation to the safety movement. One is founded on the idea that violation of safety rules is a justifiable cause for discipline. The other depends upon the power of moral suasion to engender obedience to the safety rules by awakening in the employee an active interest in the movement itself as well as a more intelligent participation in the affairs of his organization. I think no one can deny the right of an organization to penalize any of its employees for damaging or otherwise putting in jeopardy the most valuable of its assets, namely, its man power. But it seems to me that more will be attained and the movement will go farther and do more for the eternal good of man when pursued on the principle of voluntary co-operation, rather than on the principle of compulsory participation.

The Use and Care of Motor Cars on the Union Pacific

TODAY there are more than 55,000 track motor cars in service on American railroads, representing an investment in excess of $12,000,000. It is obvious that such a large expenditure must have been justified beyond any question of doubt by the fundamental economies and the increased efficiency of forces that have been obtained by the use of track motor cars.

The primary function of a track motor car is the transportation of men, materials and tools to and from work. Quick movement by track motor cars results in direct savings, in that the full efficiency of the gang is reserved for the day's work. The motor car has proved its efficiency in the quick mobilization of forces in emergencies to either reduce or prevent traffic interruptions. Various railroads have also reduced hand work to a marked degree by the use of mechanically-operated, labor-saving devices, propelled by the motor car or its motor, and under systematic supervision the motor car has been responsible for a reduction of work-train service. The degree of diversity in the use of a motor car depends entirely on the gang to which it is assigned, as also do the abuses so frequently encountered. Constant follow-up by roadmasters, supervisors and master carpenters is mandatory in order that full efficiency may be derived and abuses and misuses minimized.

The average life of a motor car is estimated to be 10 years, and, considering the comparatively few hours per week that a motor car is actually in operation, with proper care and maintenance, this estimated life of 10 years seems low enough. Its life and the service rendered depend entirely on the personal interest the operator takes in its operation and maintenance. Show me a dirty car with mechanisms covered with oil, grease and dirt and my reaction immediately is a careless operator with like habits extending into every portion of his daily work. A clean car denotes pride and renders every portion of that car open for minute inspection, and a clean car is also subjected to less wear on account of sand or abrasive substances entering movable parts.

Many Definite Rules Govern Car Operation

An alert operator can easily detect any unusual sound in his motor and in case such a sound develops, immediate attention should be given to insure against possible further damage, as motors have been completely

Have We Made As Much Improvement in Operating Practices As in Mechanical Details Since Cars Like This Were New?

wrecked and employees injured when connecting rods became loose or bearings burned out. Cars should have only specified standard equipment. The engine of a motor car must not be running when the car is placed on or taken off the track. The safe carrying capacity of each track car should be stenciled on it and this specified capacity should not be exceeded.

A track motor car should have the front wheels lifted out of flangeways where crossings are planked, before the rear end of the car is swung around, to avoid bent axles and twisted flanges. Before any car is put in service it should be fully equipped with safety rails which extend across both front and rear ends, with a hand rail extending over the full length of the deck between them to prevent men from falling in case of a sudden stop or derailment. Brakes must be maintained in such a manner as to assure a quick and positive stop. Soft iron facing on brake shoes has been found preferable to leather, rubber or wood.

Only after it is known by inspection that the motor car is in good operating condition, should the car be placed on the track, and no one should be permitted to

operate a track motor car until he has passed an examination on the rules, as well as for sight and hearing. Every operator must carry a standard watch inspected at frequent intervals and must have a copy of the current time table in his possession.

Before starting a motor car there should be a definite understanding as to what part each employee in the gang is to take in the handling of the car should an emergency arise. Necessary flagging equipment, as prescribed by the rules, should always be in readiness on the track motor car so that proper flag protection may be provided the instant it is necessary. None but employees in discharge of duty should be permitted to ride upon motor cars, except on authority, and men should be seated to face both front and rear to serve as lookouts. Where more men are to be handled than the seating capacity of a motor car will accommodate, a trailer with seats and safety rails should be attached to the rear of the track motor car. Such a car should be coupled with a rigid coupler having a minimum of slack.

Loading Must Be Done Systematically

The placing of tools or material on motor cars or trailers must be carefully done. Ends of tool trays should be high enough to prevent lining or bridge bars from slipping out. Everything about the operation of a motor car should be done in a cool, methodical manner, each man knowing what to do, and no scuffling, horseplay, joking or unnecessary talking should be permitted. All employees riding upon track motor cars should be taught and impressed with their own individual responsibility. Speed restrictions should be definitely fixed and religiously adhered to. Cars must be operated at all times with caution. When necessary to use track cars at night or during storms or fogs, a white light must be displayed to the front and a red light to the rear, and extra precautions must be taken to ascertain the exact whereabouts of other motor cars and scheduled or extra trains.

On lines of more than one track, cars must be stopped and all employees required to dismount and stand outside and clear of both tracks during the passing of a train on an adjacent track. Cars must not pass between a standing passenger train and a station unless there is a fence between the tracks. When operating motor cars on lines of more than one main track, the current of traffic must be followed unless deviations are permitted by special instructions due to grades, curves, or other conditions involving restricted vision or special operating conditions. Heavily loaded track cars which cannot be removed from the track promptly must be protected in both directions by stop signals. Employees must not get on moving track cars, except when necessary to start the car, in which case the pushing must be done from the rear end only. Only motor cars with free running engines should be used as gang cars.

Foremen Have Large Responsibilities

Foremen and others in charge of track motor cars should be required at all times to keep themselves informed as to train movements in the vicinity of their operations. Dispatchers should give line-ups to foremen of gangs and other employees operating motor cars when requested to do so, and employees receiving this information must understand that they are given such line-ups as a matter of information only and that these line-ups do not relieve them of the responsibility of protecting themselves.

Gasoline requires careful handling at all times. Carbon monoxide is fatal—never run a motor in a closed building. Excessive or bulky clothing, such as will impair vision, hearing or prompt action, should not be worn when riding track motor cars. When rails are slippery, additional care must be taken to insure the proper stopping of the motor car. Cars should be pushed through spring rail frogs and over point derails, and run at slow speed through interlocked switches. A highway vehicle has the right to cross ahead of track motor cars at public highway crossings where flagmen are not maintained, and track cars should stop and motion to vehicles to cross ahead of them, if both arrive at a crossing about the same time.

Cars Should Be Properly Equipped

Since the advent of the track motor car, its operation has been a prolific source of accidents, perhaps contributing to proportionately more accidents than any other influence. Much of this is due to the natural obstacles of a railroad with its curves and grades, the ever increasing complexity of train movements and the enormous growth of the automobile traffic. The first duty of railroad officers in furnishing track motor cars is to procure simply operated track motor cars, equip them with every possible safety device, and supplement their operation with every known self-operating feature and condition.

If it were possible to weed out the misfits and derelicts in the maintenance of way department, the problem of safety would be less difficult. Much has been done by physical examination when accepting skilled labor for service, but this still leaves the induction of the common laborers, who generally are not required to pass a physical examination. It is, therefore, imperative that the best material possible be trained for foremen, and it is mandatory that they be of the progressive, clear-thinking, positive and courageous type. It is they who must convey the rudiments of "Safety First" to both the new and the old men of the gang.

Loyalty cannot be purchased nor fixed, but is the spontaneous outgrowth of contact between the officers and the rank and file of employees with a fair and friendly interest. It is thus only that men can be taught to respect the rights of others, to reason methodically, to act with inherent self restraint and control, and to hold the rules inviolate. Safety is fundamentally a habit of mind which may be acquired by all through the exercise of ordinary caution and forethought in the small details of each day's duties.

A Part of Portsmouth Yard on the Norfolk & Western

Is Winter Rail Laying Practical?

Supervisors discuss this question in a frank manner, pointing out advantages and disadvantages*

THE LABOR problem is one that we always have with us. While this has been the prevailing opinion, many roads have found that there is a solution for this problem, and that this solution lies in providing winter work for a uniform force. The straightening of the man-hour curve requires the economical employment of forces throughout the entire year, and this in turn raises the question of the possibility of laying rail, and doing other track work during the winter months. Winter track work, and especially rail laying, is controlled, or at least affected, by geographical location. In the extreme north, winter rail laying may be limited to the months of November and December, but near sea level in the latitude of New York, many roads have found it economical to lay rail throughout the winter, using their regular track forces.

In deciding on the feasibility of winter rail laying, the varying standards of maintenance, even on different branches of the same road, must be considered. In the first place, economical rail laying in winter is based upon the assumption that the track is in good surface, and while this is not of concern on well-maintained main line tracks, there are probably many branch lines which are maintained adequately for the traffic that moves over them, but on which the surface maintained does not warrant the amount of shimming that would be required to protect new or good second-hand rail until the following spring. Local conditions also affect the results obtained from winter rail laying.

Winter Laying Helps to Solve Labor Problem

Probably the first advantage in winter rail laying upon which maintenance men can agree, permits a more uniform track force to be maintained, and increased efficiency naturally follows. The track laborer has been classed too long with the ditch-digger, as unskilled. The section man who has learned the art of tamping track is worth as much as a mechanic's helper, but camp labor, or even local labor, that is employed during the summer months only, never becomes as valuable as regular men who are given employment the year around. When business conditions are normal, particularly since European immigration has been restricted, it is a problem to find satisfactory labor, even if full-time employment is offered. The carrying on of winter work, by combining a larger proportion of the regular section men with the extra or floating forces, assures a better quality of rail laying work, and promotes the efficiency of the entire rail laying force.

All of the roads represented in this group have winter problems in ice and snow removal. Hobo labor is almost useless in a snow storm, and the savings which can be made in one heavy storm by an increased winter

*Adapted from a report on "Winter Rail Laying," presented before the Metropolitan Track Supervisors' Club, New York, on December 13, by a special committee, of which C. J. Lepperd, track supervisor, Reading, was chairman.

force of regular men will amount to more than any losses in efficiency of these men due to adverse climatic conditions during two weeks of rail laying. With the exception of days of zero weather which are usually few in this climate, labor is generally more efficient in winter than in summer. The starting of nuts on track bolts is the only operation in rail laying which requires more time in the winter, and this is much more than offset by the increased amount of heavier work which may be done in cold weather as compared with the three hot months of the summer.

Modern rail laying methods are based upon the use of power-operated cranes. Even the small rail handling cranes have many other uses than handling rail, and the locomotive crane may be used effectively in screening ballast and for handling other materials during the remainder of the year. Economy demands that labor-saving machinery be used as many days of the year as is possible. By utilizing this equipment in rail laying during the winter, when in all probability it would otherwise be idle most of the time, it not only keeps the equipment busy during the winter months, but also releases it for other work during the remainder of the year. This is an important consideration in proving the economy of high-priced machinery for maintenance of way work.

In laying rail, ties are frequently disturbed because of an overlooked spike or the stump of a spike, which is struck in setting the rail in place. This is true particularly when laying rail with cranes, and, therefore, frozen ballast is an advantage when such accidents occur.

Some of us are of the opinion that the greatest advantage in winter rail laying is that, with this work out of the way before spring, the track work for the remainder of the year is permitted to fall in the proper and orderly sequence of ballast screening, tie renewals and spacing, track raising, and final surfacing. With rail laying out of the way, also, there is a large reduction in the amount of summer work, and therefore, an orderly program for the whole summer season can be made and followed for probably two months longer than if this work must wait for spring rail laying. If rail is laid at any time after the spring months, any summer program is badly disrupted.

Disadvantages of Winter Rail Laying

The plan of laying rail in the winter has disadvantages as well as advantages, and the disadvantages may, under some local or climatic conditions, more than counterbalance the advantages. Rail is soon damaged permanently if laid in the winter where the ties are loose and where the subgrade is subject to much heaving. If the line and surface of the track are generally poor, and excessive shimming is required to maintain the surface, it is far better, undoubtedly, not to lay rail in the winter. Frozen ties are more easily split and, more care must therefore be exercised to prevent tie damage by splitting in the winter. In winter rail laying also, more care must be exercised to prevent "spike killing" by shimming, bracing and spike lining, than is necessary when laying rail in warmer weather. Damage to ties by splitting, due to frozen wood, has been advanced as the strongest argument against winter rail laying. This argument is probably based on the behavior of the more porous woods. Hardwood ties which have been treated with creosote or any oil which does not freeze, apparently are not suffering from frost splitting.

Owing to a number of conditions, there is a possible increase in the cost per ton of rail laid in winter. Extremely cold weather reduces the output per man hour, but this is limited to certain localities and is not a general condition in the Metropolitan district. Small materials cannot be distributed long in advance when snow is on the ground, or when snowfalls are to be expected, and if it is necessary to melt or remove snow and ice from the track, the labor employed for this must be added to the cost of the work. In winter, the track forces on nearly all roads are reduced, and longer hauls for part of the force are therefore necessary to assemble a rail laying gang. This adds to the cost of the work because of overtime, or a reduction in the length of the effective working day.

Suggestions for Laying Rail in Winter

Where the advantages outweigh the disadvantages and winter rail laying is attempted or adopted as part of the annual maintenance program, certain precautions must be taken, and some of the usual rail-laying methods should be changed. Regardless of the high degree of maintenance, it is advisable to surface in advance all track on which rail is to laid in winter. This should be done late in the fall and just before the ground freezes. The ballast must not be higher than the tops of the ties if it is subject to heaving and it is therefore important, as a preliminary step to winter rail laying, to remove all high ballast, and to clean it out beneath the rail for removing and replacing rail anchors.

In laying rail in the summer, small materials may be distributed in advance of the work, but in winter rail laying, all materials such as bolts, spring washers, tie plugs, tie plates, bond wires and channel pins, and under usual weather conditions, even joint plates, should not be distributed until the morning of the day on which the rail is to be laid, particularly when there is a possibility of their being lost under snow.

Usually, if snow is on the track, it is advisable to sweep it off or remove it to a level below the tops of the ties. This is true particularly if tie plates are to be changed, or if adzing is required. Light snow is removed easily by rattan brooms, but if the snow is deep or heavy, both rails must be flanged on each side by shovels or by some other effective means. One road, which uses locomotive cranes for laying rail, has removed snow by steam. In the particular arrangement used, thawing outfits were constructed of three 2-in. pipes, 8½ ft. long, plugged at each end, connected with 6-in. nipples and drilled with ¼-in. holes about 2 in. apart. Drawing this device over the rail once ahead of the work melts the snow that would interfere with rail laying.

Another interesting device developed on an eastern road, advantageous in rail laying work, is a tie-scoring machine which cuts the ties to a uniform depth for adzing. This machine is more helpful in winter than in summer, because the best trackmen sometimes fail to adz all ties evenly or to a uniform depth. If adzing is not uniformly done when surfacing is impossible, an unusual amount of shimming is required to protect the new rail.

Likewise, when the ground is frozen hard, it is out of the question to surface low spots, and where these spots exist shims must be used. Hardwood shims of different thicknesses and bored for spikes may be carried along on cranes or trucks. This work may be done by a small gang of two or three men in charge of an assistant foreman or a regular section man who is familiar with surfacing.

As track cannot be lined in winter, it is important to have small variations of line corrected by spike-lining the first rail laid. This may be done by a foreman and

several laborers immediately in advance of the full-spiking gang, and after all bolts have been tightened. Bolts must be tightened before the rail is spike-lined. After the rail is set in place, only a few spikes need be driven along each rail for the passage of the rail-laying crane, and usually these spikes are pulled before the rail is fully spiked. Therefore, no labor is lost pulling these few spikes for the purpose of spike-lining.

Sometimes during rail-laying operations tie plates are applied where there were none before. If only a part of the ties under the old rail were equipped with tie plates, it is better to place new plates only on the same ties, to avoid unnecessary adzing. This is a condition which is applicable to only a few roads, as full tie plating has been considered standard main-track construction for a number of years.

In winter rail laying, more care is possibly required in providing the correct spacing for expansion, and in applying rail anchors, although the expansion allowance depends entirely upon the temperature, and therefore, if the correct sizes of shims are used, it should make no difference when rail is laid, so far as this factor is concerned. Prompt application of rail anchors is another standard practice that should be followed regardless of the season of the year.

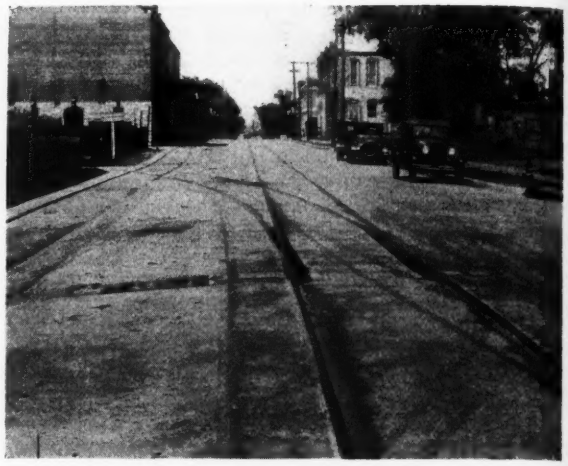
The full use of the track for the working day when laying rail has been demonstrated to be economical, and on some roads where this practice has been given a thorough trial, even the transportation department is enthusiastic about the plan and would not care to go back to the old method of laying rail under traffic. On some roads, where traffic is lighter in winter than in summer, it may be easier to secure the track during the working hours of the day, and this may be a factor favoring winter rail laying. On certain eastern roads, however, where there is more traffic in the winter than in the summer, this factor does not apply.

Rock Island Encases Tracks in Pavement

WHEN CURTIS street in Topeka, Kan., was paved with concrete, the tracks of the Chicago, Rock Island & Pacific, which occupy this street for some distance, were also encased in concrete, giving the street a continuous concrete surface broken only by the flangeways. The tracks were of ordinary construction, buried in the street and planked over to provide a surface for vehicles at the level of the street on each side. But this had proved objectionable. The track was poorly drained and subject to settlement, requiring frequent removal of the planks for the purpose of surfacing. Under these circumstances the planks did not last long, their average life being about four years.

The pavement in Curtis street is 48 ft. in width. Down the center of the street is an industry lead track belonging to the Rock Island, together with a turnout and a siding. The concrete pavement in the street area is two-course construction with a total depth of eight inches, the base course being five inches thick and the top course three inches thick. The pavement in the railroad track area is also two-course construction with a total depth of 19½ in., permitting 6 in. of concrete under the ties.

The proportions of cement, sand and stone used in both street and track areas were 1-2½-5 for the base and 1-1½-3 for the wearing surface. As a protection against shrinkage cracks, the top course of both street and track areas was reinforced with a 40-lb. welded mesh. Typical steam railroad construction was em-



The Surface of the Pavement is Broken Only by the Flangeways

ployed with respect to the ties, rails and fastenings. New ties were inserted throughout the paved area, using 6 in. by 8 in. creosoted track ties with the standard spacing. After the excavation was completed, the track was supported at its finished elevation by wooden blocks under the ties, these blocks being removed as the concrete was placed under, around and over the ties in one operation.

The concrete was carefully tamped under the ties and rails when it was first placed and then after from two to four hours it was again tamped. The long wait be-

The Ties Were Renewed Before the Pavement Was Placed

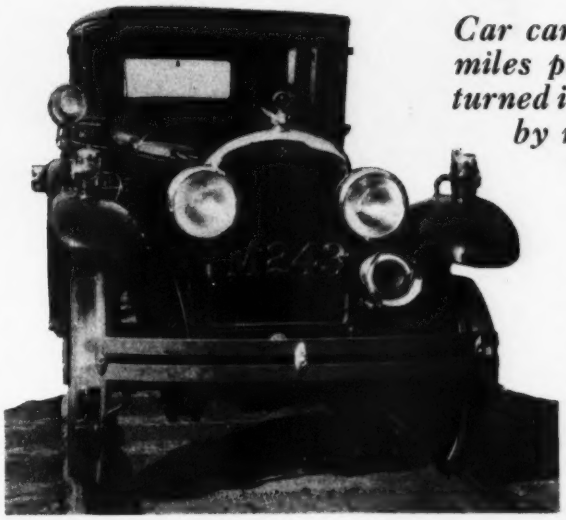
fore the final tamping allowed the concrete to get the initial shrinkage so that it was brought into firm support of the ties and rails by the second tamping. A 3-in. mastic expansion joint was carried across the street at intervals of 42 ft. and along each edge of the track pavement to assure separation between it and the street pavement slab.

Calcium chloride was used as an admixture to accelerate the setting of the concrete and cause a definite increase in strength and this was taken advantage of to get the strengths ordinarily secured by water curing. The street was closed to highway traffic for two weeks and railway traffic was kept off from 24 to 48 hours.

The 8-in. pavement cost $2.20 per square yard and the 19½-in. pavement, $4.50 per square yard. The contractor was C. B. Ramsey of Topeka, Kansas.

Something New in Cars for Fast Inspection Work

Canadian Pacific makes changes in a standard model and adds new features



A Front View of the New Inspection Car

Car can travel seventy-five miles per hour and can be turned in about four minutes by means of special jacking rig

THE Canadian Pacific has recently put in service a Cadillac track inspection car which incorporates a number of special features which adapt it particularly to the service in which it will be employed. This car, which is being used by officers of the engineering department in making long inspection trips over the lines of that road, is a comfortable seven-passenger, sedan model, and it is said that it is capable of operating on the track at a speed of from 60 to 75 miles an hour with safety.

In order to meet the more severe operating conditions on the track, both standard Cadillac axles were removed from the car, the front axle being replaced by one of more rugged construction, while the rear axle, which was mounted in conjunction with the differential, was replaced by a one-piece axle, twice the size of the original axle. The new rear axle is driven by a single gear and pinion with a ratio of 4 to 1, in place of the Cadillac's standard differential ratio of 4.91 to 1. Both of the new axles are made of heat-treated chrome-nickel steel, and rotate with the track wheels.

Axles Rotate on Ball and Roller Bearings

In this new arrangement, which was resorted to in order to minimize damage to the axles through the pounding of the wheels over rail joints and frogs and crossings, both the front and rear axles are carried in specially designed, spring-supporting journal boxes, the front axle journal boxes being equipped with ball bearings, and the rear axle boxes with both self-alining and standard roller bearings. In conjunction with this change, the springs of the car were attached to the journal boxes and were strengthened by the addition of two spring leaves. Additional stability of the car, and in particular, additional stability of the axles, has been secured through making the front of the car semi-underslung, and by the provision of two heavy adjustable tie rods which tie each journal box to the frame of the car in such a manner as not to affect the action of the springs. The main function of these tie rods is to keep the axles, and therefore the wheels, in true alinement.

The wheels of the car are of special design with cast steel centers and steel tires which were turned down from small worn engine wheel tires. Between the center and the tire of each wheel is a filler of brake lining, which was provided to lessen the noise of the car and to deaden the shocks received at rail joints and when passing through special track work. The rear wheels of the car are 33 in. in diameter between tread surfaces, while the front wheels are only 30 in. in diameter.

Three Sets of Brakes Are Provided

As conditions of braking are more severe on the track than on the ordinary highway, three systems of brakes have been provided on the car; the ordinary foot brake operating on brake drums on the rear axle, the usual type of hand-operated emergency brake, and a special supplementary brake which is applied by turning the steering wheel. This latter brake functions through brake shoes which act on the front wheels.

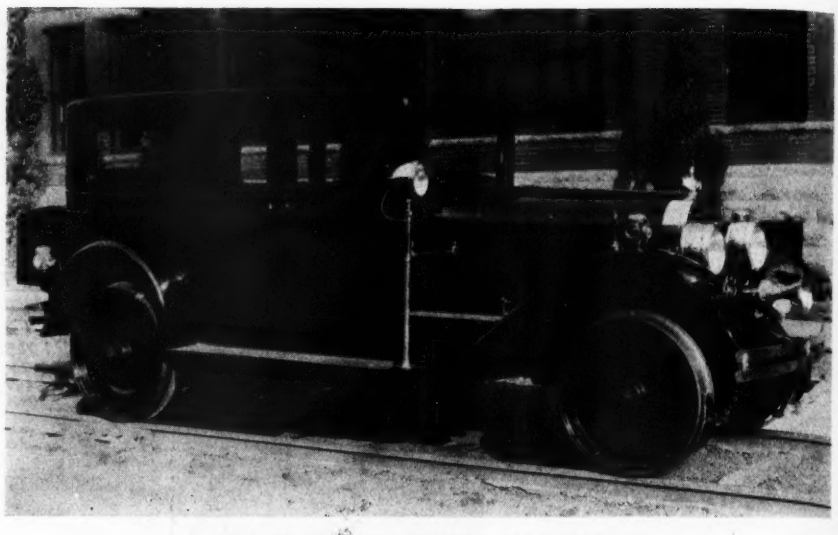
Other special auxiliary features of equipment on the car include an electric siren, an exhaust-operated horn, a hot-air heating system in which fresh air from the radiator fan is forced through a chamber around the exhaust pipe and then into the car, miniature marker and classification lights for night running, a high-powered spot light mounted on a standard on the running board for tunnel inspection work, a large metal trunk attached to the rear of the car for carrying tools and small inspection equipment, and two small metal boxes, one on each side of the car under the running board, for carrying flags, fusees, torpedoes, waste, oil, etc.

Special Turning Jack Is Provided

Another of the more important special features of the car is the means provided for raising and turning it at any point on the track. This consists essentially of a specially designed screw jack of five tons capacity, which is mounted in an upside down position near the center of gravity of the car. This jack, which has a suitable turntable plate attached to the underside of the car frame, and a broad head shoe

for providing a stable support on a track tie, is raised and lowered through a hand-operated crank shaft which extends to one side of the car just below the running board.

In turning the car, the jack is centered over a tie and the shoe is lowered only sufficiently to make the wheel flanges clear the rails. In doing this, the entire weight of the car is supported directly through the car frame, including the weight of the wheels and axles which is transmitted directly to the frame by means of a heavy chain between the frame and each journal box. When the car has been raised free of the rails, it can easily be steadied and turned about by two men. The actual time required to make a complete turn of the car is about four minutes.



A Side View of the Cadillac Inspection Car.

All of the changes in the new inspection car of the Canadian Pacific were made by the mechanical department at the Angus shops of that road, at Montreal.

What One Man Got Out of the Convention

DURING the month which has elapsed since the annual convention of the American Railway Bridge and Building Association, many of those who attended have written to their superior officers, either voluntarily or upon request, outlining their impressions of the convention and what they secured of benefit by attending the various sessions. We print below one of these letters which has come to our attention and which, it is felt, expresses not only the reactions of one bridge and building supervisor, but also the impressions of many others who were privileged to attend.

November 2, 1928.

DEAR MR. (BRIDGE ENGINEER):

I was rather disappointed not to see you at the convention last week at Boston, for it was a wonderful meeting and I believe that we all received a great deal of good out of it. I left——— Sunday night, October 21, on the "Convention Special," arriving in Boston about 10:30 p. m., Monday. There were about 250 on the special train, and we certainly enjoyed every minute of the trip, particularly that part which took us through the flood district of New England where so much damage was done to the Central Vermont and the Boston & Maine last year.

The convention opened at 10 o'clock on October 23, and all of the subjects discussed were instructive and interesting, although I am pointing out below only those which were of particular interest to me. The report on the control of motor car operation with respect to the prevention of accidents was particularly instructive in regard to the emphasis placed on the operation of cars over highway crossings; the proper care and use of flagging equipment; and the importance of getting a line-up from the despatcher before starting out with motor cars.

Another good report was that recommending greater co-operation between store department and field forces. This report brought up some things which I think should govern foremen when requesting materials and supplies. One of these is to specify exactly what is wanted, giving catalog references where possible, so that the company will not be put to the expense of buying tools and equipment which will not be entirely suited for the work at hand. Another good suggestion was to indicate on all requisitions the date that materials are required, rather than to use the word "Rush."

The report on the use of motor trucks for handling bridge and building supplies and materials brought out a great many advantages in their use over work trains and motor cars and trailers, especially in terminals. This report pointed out the importance of co-operation between the different departments in the use of motor trucks, to the end that the maximum service may be secured from them.

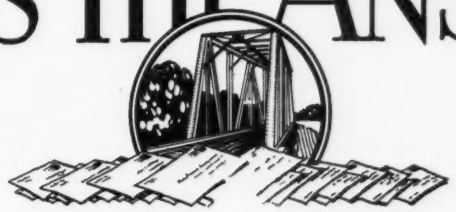
I believe the motor truck is the coming thing, for in these days when the local freight runs every second day, a lot of time is lost waiting to get our equipment moved. I think that many small repair jobs could be done with a truck with a big saving in time.

The reports on the relative merits of jacking or tunneling pipe through a roadbed under traffic, and on the organization and equipment for handling emergency bridge and building work, were also very interesting and instructive. The latter report again pointed out the importance of co-operation between the forces engaged in the work and the operating and stores department, and especially with the chief despatcher, so that he can govern the movement of trains properly. The report on the painting of railway stations and allied structures emphasized the advantages of following a set program in handling this work, over the "hit and miss" method, and also the importance of thoroughly cleaning and preparing surfaces to be painted, and the care necessary in the handling and storage of paints and oils.

The reports and discussions at the convention were of very much benefit to bridge and building supervisors and foremen, as many ideas were presented and suggestions made concerning problems which we have to deal with from time to time in our daily routine work. I am grateful for the privilege of belonging to this association, and for having been able to attend the convention.

"B. & B. SUPERVISOR."

WHAT'S THE ANSWER?



Have you a question you would like to have someone answer?

Have you an answer to any of the questions listed below?

QUESTIONS TO BE ANSWERED IN THE MARCH ISSUE

1. *What advantages, if any, are derived from oiling rail joints in dry climates where protection from brine drippings is not necessary? Does such oiling prevent "freezing" of the joints and permit a readier adjustment of expansion and contraction?*
2. *What is the best method of determining the character of the foundations of piers and abutments of small bridges when the original records are not available?*
3. *Does the use of hardwood ties at the joints and softwood ties under the rest of the rail accelerate the pumping of joints?*
4. *What are the relative merits of creosoted pile heads and concrete pedestals as foundations for small frame station buildings?*
5. *What is the practical minimum rate of grade for drain tiles in cuts? To what extent does this depend on the uniformity of the grade?*
6. *What is the best method of handling and storing soda-ash for water stations to avoid undue expense and waste?*
7. *What are the relative merits of the methods of lining turnout curves by offsets from the main-track rail and by ordinates from the chord of the curve? What precautions are necessary in the use of either of these methods to insure accurate results?*
8. *When an air compressor is installed for riveting on bridge erection, what other air-driven tools can be used to advantage?*

Heavy Power on Light Rails

When heavier power is to be placed in service on lines laid with light rails, what special attention should be given to track maintenance?

The Foundation of the Track Must Be Improved

By C. W. BALDRIDGE

Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

The placing in service of heavier power on lines laid with light rails naturally means that longer and heavier trains, as well as the heavier locomotives, are to be moved over the tracks in question. In order to insure their safe movement, it is necessary to place the track in good surface by strengthening the elements of support, leaving out of consideration the strengthening of bridges, since the question is confined to track maintenance.

As a rule, where light rails are in use, the track is carried on dirt roadbed without ballast. In all cases, it is important that good ditches be opened to carry away the water which falls upon or seeps into the roadbed. Next, all "dirt" track should have the dirt heaped up in the center of the track just as high as the equipment, engine pilots, brake rigging, etc., will permit. This filling should be rounded on top, then slanted off on each side to such an extent that the surface at the ends of the ties is slightly below the bottom of the ties. The earth in the center of the the track holds the track in line, and the slope provides good drainage, thus aiding greatly in maintaining good surface.

Where the track is ballasted, the opening of ditches is as important as where "dirt" roadbed is in use. In addition to ditches, it is important that the roadbed shoulders be kept sloped away from the toe of the ballast to provide drainage through and from the ballast. The widening of the roadbed shoulders is frequently necessary to help carry the heavier loading of the track, and additional ballast is usually advisable.

As a rule, additional ties per rail length are needed when any considerable increase is made in the weight of power. Whether additional ties are needed or not, it is certain that close attention must be given to the replacing of all decayed or broken ties.

In many cases, light rail is used without tie plates, and the supplying of tie plates adds greatly to the effectiveness of the ties. In most cases, however, the placing of heavier power in service is a forerunner of the use of heavier rail and if tie plates are supplied for the light rail, they should be of such size and design as will permit of their being used with the heavier rail when the time comes to put it into service. Improvements in roadbed and ditching, more and better ties and tie plates of such design that they can be continued in use with heavier rail, as well as additional ballast, are all useful when the time comes for its installation and are, therefore, not a waste of money; on the other hand, anything done which cannot be adapted to further improvements is likely to be uneconomical.

When heavier power begins to operate over light rails, track forces will find it necessary to give closer attention to the soft spots which are sure to develop in the track. They must also be on the lookout for rail failures, which invariably develop under the added stresses. The rail failures to be watched for particularly are the mashed spots in the heads, head

checks and fillet cracks. The mashed spots in the heads are easily found as they can be seen from a motor car or by a track walker. The head check rails are not hard to find if track men know what they are. The head check condition consists of small hair line cracks extending around the gage edge of the rail part way across the head. The fillet crack is the most difficult to find, for the reason that it consists of a fine line crack which develops lengthwise of the rail at the top of the web just under the rail head. To find it one must stoop low enough to look under the rail head or use a small mirror.

An increase in the weight of power operated over any track increases the tendency toward bad track and defective conditions, with a consequent increase in the care and attention which maintenance forces must exercise in the upkeep of the track, and this usually means that an increase of maintenance forces will be necessary.

Good Support Must Be Provided for the Rails

By Division Engineer

The problem of preparing track for the operation of heavier power on lines laid with light rail depends on the circumstances under which the heavier power is introduced; in other words, whether it is a matter to be expected for a short time each year as during the movement of wheat over a branch line in the North or West or of sugar cane under similar conditions in the South, or a case of emergency where the heavier power must be introduced with no advance notice.

In the former case the matter is simplified, since the track can be brought to as good condition as the funds at hand will permit, before the period when the heavier power is used. The principal thing is to have good ties, and to get rid of soft spots in the track since these will throw extra strain on the rails, which are carrying all they should under the best of conditions. Soft spots can usually be helped by digging out the mud and replacing it with cinders, which, in addition to being always available, are easily worked with the small gangs that are ordinarily allotted to branch lines with light traffic. The ditches should be opened up where necessary to assist the drainage.

Where the heavy power must be introduced without advance notice, the problem is entirely different, since such lines are likely to have been maintained only to the condition demanded by the light power. The writer recalls an extreme case of this kind when he was roadmaster, where, owing to floods in the Mississippi river, it became desirable to use a branch line 11 miles long, connecting the main lines of two roads, to permit the operation of trains of both roads and thereby save each road a detour of approximately 100 miles. The branch in question had been maintained only for the operation of a way freight and was laid with 56-lb. rail. The ties were in poor condition and what little ballast there was consisted of sand.

As soon as it was decided to divert the main line trains over this branch, four section gangs of 10 men each were assigned definite limits on the branch and set to putting in ties, a plentiful supply being rushed to them. The foremen selected were men of good judgment who could be depended on to carry on the work expeditiously and safely, since it was impossible to give them much supervision. Slow orders were placed over the entire length of the branch, beginning with 10 miles an hour, but these were raised moderately as the work progressed. During the 10 days that the branch carried the main line traffic of the two roads there were few broken rails and no derailments.

When heavier power is assigned permanently to lines laid with light rail, it will usually be found economical to relay the track with heavier rail released from other lines. Until such heavier rail can be laid, special attention should be given to providing a good support for the rails by putting in plenty of good ties, taking care of the drainage, maintaining good surface and applying anti-creepers to keep the rail from running. It it is impossible to hold the track after this has been done, slow orders should be placed wherever necessary, since speed is especially destructive to track laid with light rails over which heavy power is operated. The increasing tendency to replace light rails on branch lines with relay rail of heavier section is a move in the right direction and will become of increasing importance as the light motive power now in use is retired.

Inspection of Roofing

For what conditions should one look particularly when making an inspection of roofing?

Varies with the Kind of Roofing Used

By A. T. Hawk

Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

The particular points to be looked after when making an inspection of roofing will naturally vary with the kind of roofing and may be summarized as follows:

Metal roofing should be inspected for painting and for "pin holes" in the metal. If any pin-holes are found, they may be filled with an asphaltic compound, after which the spots should be given a coat of paint.

Prepared roofing should be inspected to see that the painting is maintained in good condition, where the roofing requires paint. This should be done about every three years, as the cost is comparatively small, while the life of the roofing will be lengthened materially.

Tar and gravel roofs should be inspected for bare spots or places where the gravel has become loosened. If such places are found, the necessary patching should be done and the gravel reapplied. The exposure of the roofing membrane to the sun and weather is apt to cause it to deteriorate rapidly, hence repairs should be made promptly as soon as they are needed. I have known tar and gravel roofs to be maintained in good condition for 20 years by this method.

For either tile or slate roof, it is necessary to look for broken units which permit water to seep through. Such roofs can be carried along by patching up to a certain point, after which it is usually more economical to remove the old roofing and apply new tiles or slates, as the case may be. With tile roofs, much of the old tile can be salvaged and used with the new tile, and, when this is done, it is usually better to place the old tiles together on one side of the roof for the sake of better appearance. There is not much salvage with slates, as they are apt to be broken in handling. When these roofs are renewed, a close inspection should be made of all flashing. It will usually be found best to renew it, since these roofs have a long life and unless the flashing is in excellent condition when the roof is renewed, it should be renewed also.

With asphalt shingles, it is necessary to see that the corners of the shingles are held down to the roof if they are not of the self-locking type. This can ordinarily be done by using an asphaltic roofing compound which will cause the corners to adhere to the shingles beneath.

Systematic inspection and prompt repairs will do much to lengthen the life of roofing as well as to prevent damage to the roof structure or the contents of the buildings from water leaking through the roof.

Hidden Defects Should Be Looked for

By Inspector of Buildings

When inspecting roofing of all kinds, there are many defects which are easily seen, while there are others which are more difficult to detect. Of these latter, probably the most important are the condition of the flashing and the fastening of the roofing to the roof itself.

Neglect of either of these features is apt to be troublesome and expensive, since the percolation of water through defective flashing may cause serious damage to the building, which could be avoided by maintaining the flashing in good condition. Any loose places in the roofing should also be repaired promptly, because even if they do not cause leaks, they may result in the roofing being blown off during heavy winds.

Removing Cribbing from Washouts

When track has been cribbed up to carry it over a washout, how far is one warranted in going to remove this cribbing as filling is placed?

Ordinarily Not Necessary to Remove Cribbing to Great Depth

By W. M. Neptune

Principal Assistant Engineer, Missouri Pacific, St. Louis, Mo.

Theoretically, all cribbing should be removed, but practically, this procedure is impossible. The time available for putting the track in service and the expense which would be incurred in the removal of the cribbing ordinarily only warrants the removal of that cribbing immediately under the ties to a depth of about the equivalent of the original elevation of the subgrade.

Experience indicates that a reasonable amount of cribbing embedded deep down in the fill may be left without doing any damage. We have only recently uncovered timber which had been in an embankment for 30 to 40 years and which was perfectly sound. I believe that cribbing which is left deep down in the fill will rot so slowly, if at all, that the riding conditions of the track will not be affected.

All Cribbing Should Be Removed if Washout Is Shallow

By A. E. Preble

Supervisor, Pennsylvania, Pottsville, Pa.

The depth to which cribbing should be removed after a washout depends on two factors: The depth of the washout and the value of the material used for cribbing. If the washout is shallow, say not over 10 ft. deep and new material has been used for cribbing, it should all be removed. In deeper washouts, or if the cribbing material has no salvage value, it can all be left in except the top portion for a depth of 18 in. or 2 ft. below the bottom of the ties. The cribbing left in the embankment will never interfere with the stability of the track.

Painting Bridges in Cold Weather

What special precautions should be taken in painting bridges in cold weather?

Winter Painting Is Apt to Be Unsatisfactory

By Frank Cramer

Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

We have never made a practice of painting bridges during the winter months, but have done so occasionally. Our limited experience with painting in cold weather has not been satisfactory, mainly on account of the difficulty in having the steel dry at the time the paint is applied. During cold weather, the steel is very cold during the night and even if frost does not form on it, moisture is apt to condense on it during the daytime as the temperature rises, preventing the paint from adhering to the steel. The exhaust from the smokestack of the locomotives, which contains steam, also condenses on the upper members. As a result of these conditions we have had cases where painting done in the winter has peeled off the following summer, sometimes in flakes six or eight inches square. Where sand-blasting is done, followed closely by the painting, the results are better, as the air, heated by compression, and also the friction of the sand on the metal, dry the film of moisture on the steel. We have also had trouble with winter painting when a sudden and severe fall in temperature occurred before the paint had set. The reason for this is not entirely clear, but it seems to be accounted for by the "freezing" or solidifying of the oil in the paint.

On account of these handicaps, we never paint steel bridges in the winter if it can be avoided, and when it is necessary to do so we try to select weather which is comparatively warm and dry.

Winter Is a Good Time to Paint Bridges

F. C. Huffman

Assistant Chief Engineer, Chicago & Northwestern, Chicago

From my experience, I consider winter the best time of the year, in many respects, for the painting of steel bridges in northern climates. Except in such localities as are humid, with moderately cold weather, the steel is apt to be drier than in the summer time when there are frequent rains. Moisture on the steel is one of the most frequent causes of paint failure, no matter at what season the painting is done, and care should always be taken to see that the steel is dry before the paint is applied. Paint applied in the winter time avoids the rapid evaporation which occurs in hot weather, while I have never observed any bad effects with paint which has been exposed to freezing weather before it has dried. There is less dust and there are no insects in the winter, and while these are not serious in bridge painting, their absence is an advantage.

When winter painting is done, company forces should be employed in order to keep better control over the work, and to insure that painting will be done only when conditions are right. This procedure has the further advantage of giving steady employment to the paint gangs throughout the year, thus keeping experienced men on the work.

Widening Embankments in Prairie Country

What is the best method of widening embankments in prairie country where the height of the embankment does not exceed five feet?

Crawler-Tread Draglines Are Rapid and Economical

By A. Chinn

Engineer Maintenance of Way, Chicago, Burlington & Quincy, Lincoln, Neb.

The answer to this question depends on the length of the embankment to be widened and the thickness of the slab to be added. Embankments of considerable length, one thousand ft. or over, that require the addition of a slab two ft. or more in thickness, can be widened most rapidly and economically with a gasoline-driven crawler-tread dragline. Both sides of a five-ft. fill can usually be widened with the machine working on one side, but in the interest of leaving clean ballast and doing uniform and faster work, it is found best to work up one side and down the other. It should not be overlooked that a dragline can work on embankments considerably higher than five ft., as the average machine can place material on fills that are 15 ft. high without difficulty.

There may be occasions where fills are short and scattered, and only a small amount of material is required to bring them to standard, where it will be found advantageous to use teams with slips than can be secured locally, thereby eliminating the delays and cost of moving a dragline from one small job to another. However, where work of this nature is contemplated it is usually of sufficient magnitude to warrant a dragline, which is the fastest, cleanest and cheapest way of doing the work.

Either Elevating Graders or Draglines Can Be Used to Advantage

By Engineer Maintenance of Way, Western Road

Assuming that material for bank widening cannot be secured from the necessary ditching of adjacent cuts, there are several methods used in widening of embankments in prairie country where the height of the embankments does not exceed five ft. The selection of the method which will prove most economical depends to a large extent on the amount of material to be placed. If only a small yardage is required and this is more in the nature of raising the shoulder and squaring it out than actual bank widening, the work can probably be done more economically by the use of teams than in any other way.

Where the yardage to be placed is sufficient to justify the working of equipment, bank widening can be done very economically and a neat and uniform job can be secured both in widening the fill and in making the excavation from which the material is secured by using an elevating grader, the material being deposited in position on the embankment direct from the elevator of the grader. The ditch or borrow pit from which the material is taken by this method is straight and uniform and at an equal distance from the toe of the slope. The elevator can be pulled either by horses or a crawler-tread tractor, as determined by local conditions and the equipment available.

Bank widening under the conditions outlined can also be done economically by the use of crawler-tread dragline equipment. This equipment, of course, can be used where the height of the fill materially exceeds five ft. and is perhaps better adapted and more economical where the amount of material to be placed in greater than it would be on the average fill not exceeding five ft. in height.

After the bank widening material is deposited by either the elevator-grader or dragline method, the fill can be smoothed and cut to the required height by the use of a standard spreader. If reasonable care is exercised in the placing of the material, the finished fill will be uniform in width and present a neat and attractive appearance and the experienced operator can build the fill to the desired dimensions with little excess or waste material.

The preliminary preparation in advance of bank widening such as throwing up the ballast shoulder to conserve it, cutting weeds off the fill, plowing or in some other way preparing the fill so as to assist in bonding the new material and the old, depends altogether on local conditions. If the ballast is in condition to justify saving, a large per cent of it can be saved by casting it up on the ends of the ties. Generally, in prairie country where the fill does not exceed five ft. in height, the matter of a bond between the old and the new material is not serious and the new material will usually adhere to the old embankment without any further preparation than the cutting and removal of any growth of vegetation on the slopes of the fill.

Standardization in Water Service

To what extent can water-service supplies and equipment be standardized?

Offers a Broad Field for Standardization

By C. R. Knowles

Superintendent Water Service, Illinois Central, Chicago

There is undoubtedly much room for improvement in the standardization of water-service facilities, although definite progress is somewhat difficult on account of the diversified nature of railway supplies and equipment and, in an even greater degree, to the wide variations in the methods of handling water-service work on different railroads.

The marked development in railway water service within the past few years has further retarded the progress of standardization. During a comparatively short period of time our water stations have seen the evolution of pumping equipment from horsepower and windmill to hot-air engine, steam and gasoline engine and the semi-Diesel engine and electric motor of the present. The recognition of the necessity for a better quality of water for locomotives, followed by the development of new supplies and the construction of water-treating plants at some 1,500 water stations during the same comparatively short time, has offered still further complications in the establishing of fixed standards.

In spite of the fact that railway water service has been in more or less of a state of evolution, certain railroads have made some progress toward uniformity both in water-service equipment and in organization and methods of handling work. Such progress as has been made is due, in no small part, to the work of the American Railway Engineering Association, and the continued activities of the Committee on Water Service of that association promises still further development.

Water-service standards, as established by the

A.R.E.A., include the following items of water-service equipment:

Wooden water tanks of 50,000 and 100,000-gal. capacity.
Round hoops for wooden water tanks.
Timber substructures for 50,000 and 100,000-gal. water tanks.
Specifications for the following chemicals used in the treatment of boiler waters: hydrated lime, quicklime, soda ash and sulphate of alumina.

The American Water Works Association standard specifications for cast-iron pipe and special castings have also been adopted. In addition to these standards, the A.R.E.A. also sets forth general principles of water supply and standard methods of water analysis and for calculating economies of water treatment, together with a complete outline of a water-service organization.

These standards and principles of railway water service are contained in the A.R.E.A. Manual of Recommended Practice and are followed to a certain extent by railroads represented in the A.R.E.A. membership, depending largely upon the existing water-service organization on each road, as it will naturally be found that the success of any attempt to establish standards depends almost entirely upon the manner in which the work is handled.

Satisfactory results in standardization are hardly to be expected from a loosely organized department in which the authority and responsibility are not clearly designated or defined. Even less is to be expected of one where there has been little or no effort toward organization and where there is divided responsibility, with as many different methods as there are districts or divisions.

Certain definite standards can, of course, be established with any kind of an organization and their application can be rigidly enforced, but the desired results can only be attained when such equipment is selected and applied under the jurisdiction of an organized department with a thorough knowledge of the use for which it is intended. It is, therefore, apparent that if the full benefits are to be secured, it should be carried out under a department with centralized authority and responsibility for design, construction, operation and maintenance.

The following water service supplies and equipment would appear to adapt themselves readily to standardization: Tools, valves, water columns and pumping units, including engines, motors, boilers and pumps, and packing of all kinds. Piping of all kinds as used in water service work is pretty well standardized; however, there is a possibility of further economy by a reduction in the number of sizes of pipe used. As a suggestion, for example, it might be well to consider the adoption of 3-in., 4-in., 6-in., 8-in., and 10-in. sizes eliminating 3½-in., 4½-in., 5-in., 7-in. and 9-in. sizes in threaded pipe.

Cast-iron pipe with bell and spigot joints, as manufactured under A.W.W.A. specifications, is being used by practically all roads for underground pipe lines, the exceptions being certain roads on the Pacific coast where wood pipe has been used extensively on account of its lower cost and the use, to a limited extent, of both cast-iron and wrought pipe with special joints.

One of the most important features of standardization is concealed equipment, such as underground piping systems and particularly valves. It is extremely difficult to keep a complete record of these valves, and if many diffierent types or valves are installed, an accurate record is almost impossible. It would appear, therefore, that the standardization of these valves is especially desirable so that the supply of repair parts may be reduced to a minimum and be readily available for repairs without the necessity of digging up the valve in order to determine the type needed before ordering repairs.

It is hardly to be expected that the standardization of valves can be carried out to the extent that all valves will be uniform and the parts interchangeable, but it is entirely possible that standards can be established as to certain requirements, as for example, the pressures to be carried. In their zeal to reduce the number of stock items carried, storekeepers have, in some cases, stocked one weight of globe valve for all purposes, including locomotives and general service, with the result that the more expensive high-pressure valves have been issued for service where a less expensive valve would have answered quite as well. In other cases, valves designed for steam have been used for water or vice versa, and this is particularly true of valves with composition seats and disks. It is, therefore, highly desirable that standards for valves used in water service be established and maintained that will insure the proper valves being furnished as a matter of both economy and of efficiency.

Stocks of packing may be reduced in some cases by giving careful consideration to reducing the number of different sizes and kinds carried to the minimum consistent with actual requirements. This is particularly true of sheet-rubber packing, which is commonly furnished in six different thicknesses: $\frac{1}{32}$-in., $\frac{1}{16}$-in., $\frac{3}{32}$-in., ⅛-in., 3/16-in. and ¼-in., but it will be found by making a survey of the actual requirements, that in most cases this list can be reduced.

While a certain uniformity exists as regards the more common tools used in water service work, such as wrenches, taps, dies, pipe cutters, vises and tools common to other departments, there apparently has been little successful effort to establish a uniform tool and equipment list. Practices vary even on different divisions of the same railroad. This variation is not due so much to lack of co-operation as it is to conditions under which the work is performed. It is possible that initial efforts toward the standardization of water-service tools should be directed toward establishing more comprehensive and uniform methods of performing construction and maintenance work, particularly as regards maintenance.

The committee on Water Service of the American Railway Engineering Association prepared a list of tools for maintenance and light construction work some years ago. This list represents the best practice on a number of the larger railroads. A survey of the tools as listed, however, does not indicate that there has been any marked development in the direction either of standardizing or improving tools used in water service work. It is to be expected that more uniform practice will follow the development of water-department organizations.

Can Be Done to Advantage in Many Directions

By R. C. Bardwell
Superintendent Water Supply, Chespeake & Ohio, Richmond, Va.

The standardization of water-service supplies and equipment is most important to the efficient and economical operation of railway water stations. Since a complete discussion would involve a lengthy article, only a few of the major general items are mentioned in this reply.

With the present desire for reduction in roadway material stocks, interchangeability of equipment will enable a marked decrease to be made in emergency units

and repair parts carried on hand, as well as facilitate the repair and installation work through the increased familiarity of the employes with the various parts and their application. Standard steam boilers for general pumping service should be limited to the smallest number of sizes, preferably not over two, and designed structurally to meet the requirements of the most rigid boiler law in the states traversed by the railway. Steam pumps can be standardized to advantage, both as to type and size. For general service conditions, one standard size and type of centrifugal pump, in which the diameter of the impeller can be changed readily to meet local conditions, will effect appreciable improvement. Limiting the number of sizes of oil or gasoline engines has proved beneficial. Interchangeability of electric motors will affect a saving in emergency units required. The standardization of water columns, both as to size and type, has proved to be of decided advantage in avoiding delays to service.

It has been found good practice to limit the size and design of wooden water tanks to the two sizes and specifications recommended by the American Railway Engineering Association. Steel tanks will vary in size and capacity to conform with local requirements, but it is well to maintain the structural features in conformity with the specifications recommended in the A.R.E.A. Manual.

The requirements for treating plant equipment will also vary to some extent with local conditions, but the standardization of proportioning equipment and the limiting of the number of plant capacities will frequently improve both maintenance and operating conditions.

Pipe sizes should be limited to the customary requirements. For example, it is recommended that the use of 3½ in., 5 in., 7 in. and 9 in. pipe be discontinued in railway water service. For cast-iron pipe and fittings, the standard specifications of the American Water Works Association have been found generally acceptable. Standardization may also be extended advantageously to pump valves, packing, oils, and grease. Tools, for both running and heavy repairs should be confined to the minimum in size, type and kind.

Wherever local conditions permit, it is well to maintain, as far as practicable, similar designs in water-station installations. As a matter of fact, there are few practices in railway water supply work where standardization in water-service supplies and equipment cannot be applied with good results.

Derrick Car vs. Locomotive Crane

What are the relative merits of the locomotive crane and the ordinary "derrick car" for bridge maintenance work?

The Locomotive Crane Has Several Advantages

By I. L. Simmons

Bridge Engineer, Chicago, Rock Island & Pacific, Chicago

While the derrick car has served its purpose well in the past, the locomotive crane has several points of superiority in bridge work, the principal ones being the reduction in the number of men necessary to operate the machine, its greater speed of operation, and its adaptability for other purposes when not engaged in bridge work. These are all important factors and result in economy in spite of the higher cost of the locomotive crane.

The locomotive crane not only requires several less men to operate, but it is also by reason of its higher traveling speed, usually able to dispense with the service of a locomotive and full work-train crew when working on main tracks. Owing to the slow rate of travel of derrick cars, we never permit them to work on the main track without a locomotive, and when a sidetrack is put in near the job to permit the work equipment to clear the main track for trains, the locomotive, together with the greater length of the derrick car, requires a longer track than is necessary for a locomotive crane.

The greater speed of operation of the locomotive crane also results in economy by permitting the execution of a greater amount of work in a given time than is possible with a derrick car. In addition to this feature, the ability of the locomotive crane to work from either end by revolving on its base obviates the necessity of turning the carbody which must sometimes be done with the derrick car.

The adaptability of the locomotive crane for other work than bridge erection is a valuable feature of this machine. Of necessity, it is impossible to keep either a derrick car or a locomotive crane busy at all times on bridge work, and when not so engaged, the locomotive crane can be used to advantage for a number of other purposes, while the capabilities of the derrick car, aside from bridge work, are limited, not only in the kinds of work, but also in the facility with which it performs them as compared with the locomotive crane. In this way, in the course of the year, the crane can be kept busy to a much greater extent than can the derrick car.

The Derrick Car Is Becoming Obsolete

By Division Engineer

The derrick car is fast becoming obsolete as a bridge maintenance facility because its use is generally confined to the handling of heavy materials such as girders and the placing of culvert pipe. As the boom movement is limited, great care must be taken in unloading material to see that it is placed conveniently near the track. Where culvert pipe is to be placed through high fills, the handling of the pipe becomes quite a problem, and especially so with the derrick car. The derrick car as a general rule is not of the self-propulsion type and therefore requires a locomotive to handle it, with the attendant work train service charges. Owing to the limited amount of work that the derrick car can handle and on account of the expense, we find that this facility is idle a great portion of the time.

The locomotive crane for bridge maintenance is more serviceable: First, on account of being self-propelling; second, the entire machine is on a turntable, permitting a full-circle swing of boom; third, a longer boom can be utilized and therefore work can be done to better advantage; fourth, on account of the self-propelling feature, the crane can be operated to good advantage under favorable traffic conditions without work train service, using a trainman as pilot; fifth, it can be used as a pile driver when equipped with swinging leads.

However, I do not believe that any division can warrant an expenditure for one of these machines for bridge maintenance alone, but on account of the versatility of these machines, they can be employed at other classes of maintenance work to good advantage, such as assisting in rail renewals, ditching, working in supply trains and picking up scrap. All cranes should be equipped with generators and should have magnets.

On account of the many duties which a locomotive

crane can perform under its own power and without work train service, it is economical in operation, considering the number of days the "derrick car" is idle, compared to the number of days the locomotive crane can be employed. Therefore, there is no question as to the superiority of the locomotive crane.

Constructing French Drains

What is the best method of constructing a French drain so that it will remain effective the longest possible time?

Must Be Constructed to Permit Free Flow of Water

By J. J. Desmond

Roadmaster, Illinois Central, Chicago

Considerable trouble is often experienced with embankments in which water accumulates because the soil of which the embankment is composed is not porous enough to allow it to drain off. In order to overcome conditions of this kind, French drains are often installed. In constructing these drains, the trench should be approximately four feet wide and should extend to the bottom of the wet spot, or, if necessary to the surface of the natural ground, with sufficient fall to carry off the water freely. The material excavated from the trench should be disposed of where it will not interfere with the drainage, and the trench should be filled, preferably with broken stone or small-sized rock, although if these are not available, coarse cinders may be used, the filling materials being placed so as to permit as free a flow of water as possible. French drains so constructed often make it possible to maintain good riding conditions over embankments which would otherwise cause trouble on account of soft track.

It is usually better to carry the drains from the outside of the track to the foot of the embankment on the opposite side, instead of carrying them across the full width of the embankment, alternating from one side to the other unless local conditions make this impracticable.

Coarse Material Should Be Used for Filling Trench

By Engineer Maintenance of Way

French drains become ineffective through the voids between the filling material becoming clogged by silt or other fine particles which work their way down from the surface. For this reason, the materials selected should be those which will have a large percentage of voids when in place, covered with finer materials which will tend to retard the entrance of silt.

Where gravel ballast is screened to remove the larger pieces, these make a very good material for filling the trench. The rounded shape of these pieces insures a large percentage of voids if care is taken to select pieces of about the same size. In placing this material, the larger pieces should be put at the bottom of the trench, with the smaller pieces above them. The upper part of the trench should be filled to a depth of about a foot with coarse gravel containing a minimum of sand or with coarse cinders. As this upper layer becomes filled with fine material, it can be removed easily and replaced with fresh material to prevent the fine material finding its way to the coarser particles and thus clogging the voids and obstructing the drainage.

If such material is not available, riprap or coarse cinders may be used. Of these, the cinders usually give the best results, since the water will percolate through the cinders, while if stone is used, the pieces are apt to lie in such position as to leave few voids between them.

Damage to Ties by Tamping

A further answer to a question discussed in the November issue.

To what extent are the bottoms of ties, particularly those of soft woods, damaged by tamping? What practical means can be used to prevent this damage?

Mechanical Tie Tampers Obviate Damage to Ties

By W. H. Armstrong

Manager Tie Tamper Sales, Ingersoll Rand Company, New York

In the November issue there were published two replies to this question. I would like to supplement these, by quoting from a paper presented before the American Wood Preservers' Convention some time ago by one of our prominent executive engineers, as follows:

"The wearing away of ties by ballast is the result of tamping the ballast under the tie and the action of the tamping tool striking the side of the tie, rather than the action of the tie bearing upon and working in the ballast under train loads. There is but little mechanical wear due to the tie working in the ballast.

"Ties which are removed after service in hard-ballast track are found to be pitted or indented on the bottom or sides from contact with the stone or other material. These indentations are a valuable factor in holding the track in line and surface as long they are not increased by frequent tamping. The continual tamping of the ballast under the tie soon rounds off the edges of the tie, leaving little or no flat bearing surface for support. When this happens, the tie acts as a wedge and tends to force the ballast out into the cribs instead of receiving full support from it. The greatest wear occurs from six in. to eight in. on either side of the rail and there is practically none directly under the rail. In track maintenance, the best practice is to tamp the tie for its full bearing on the ballast outside of the rail and for an equal distance inside. When a tie becomes rounded at the bottom at the most essential tamping point and becomes difficult to maintain to surface, it is then found more economical to replace it with a new tie having a flat bottom that will necessitate less tamping."

The practical means to prevent this damage seems to me to lie in the mechanical tie tamper. The principle employed in the mechanical tamper minimizes this wear on the tie, owing to the fact that the blow is not delivered directly against the ballast nor against the side or edge of the tie, but is delivered on the upper or shank end of the tamping bar. The face of the tamping bar, which is ⅝ in. by 3 in. in most cases, remains in contact with the ballast while being tamped, and the action is to shove the ballast under the tie. There is no sliver-ing of the tie, due to misstruck blows of the tamping bar or pick. The mechanical tie tamper also has a tendency to minimize the breakage or crumbling of the ballast.

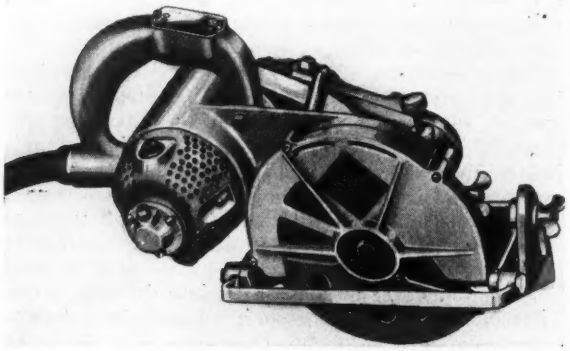
In using the mechanical tie tampers, it is not necessary to clean the ballast out to the bottom of the ties as is the case in hand tamping, for the reason that the tie tamper will work through the ballast, using the tie as a guide, until the bottom is reached when it will force the ballast under the tie, doing no injury to the tie.

New And Improved Devices

A New Electric Handsaw

THE Wappat Gear Works, Inc., Pittsburgh, Pa., which has recently withdrawn from the gear business and is now devoting its entire plant to the manufacture of labor-saving tools, has developed a new small electric handsaw, which is designed especially for a wide range of light cutting work. This new saw, which is intended to replace the common hand-saw and to speed up sawing operations, is a light, rugged, motor-driven unit, which can be operated by one hand.

The new saw has a cutting capacity of two inches and is built in three models; one for plain square



The New Wappat Power Saw

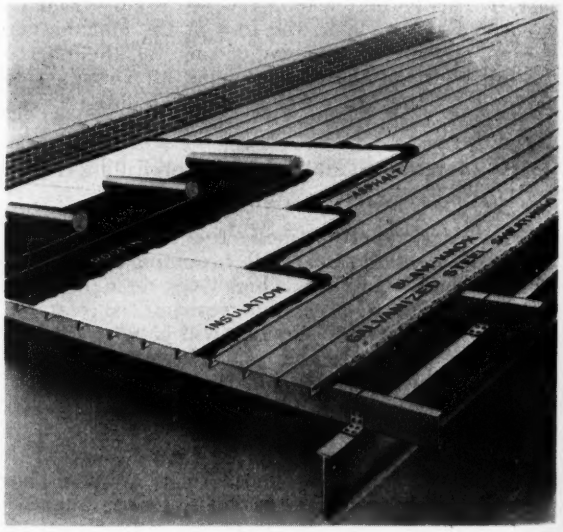
cutting, one for bevel cutting, and one with an adjustable dado cutter for grooving. All three models are provided with a fixed upper guard and a movable lower guard, which completely enclose the saw blade. The lower guard opens gradually by telescoping into the upper guard as the saw is pushed into the material, and snaps back immediately after the cut is finished, thus affording protection to both the operator and the saw blade. In all of the models, the saw-holding shoe is adjustable vertically, making it possible to set the saw so as to cut to any required depth within its range.

Power for the operation of the saw is supplied by a high-speed universal motor, mounted on ball bearings and fan-cooled; the fan also throws a blast of air to the front of the saw to clear the sawdust away and make it possible to follow a line accurately. The saw shaft, which is mounted on tapered roller bearings, is driven by helical gears, which, in turn, are mounted on ball bearings. All of these bearings are completely enclosed and run in grease. Control of the saw motor is effected by means of a double-pole non-arcing switch which is mounted in the saw hand grip, within easy reach of the operator's forefinger. The frame is of aluminum and certain parts are made of heat-treated aluminum alloy in order to obtain maximum strength and durability with a minimum of weight. All exposed steel parts of the saw are specially rust-proofed. For convenience in using the saw in a shop, the company also manufactures a specially designed steel saw table, 16 in. by 26 in. and 11 in. high, to which the saw can be attached.

A New Steel Roof Sheathing

A NEW type of roof sheathing, known as "Blawsteel" sheathing, has been developed by the Blaw-Knox Company, Pittsburgh, Pa., for buildings designed with flat roofs. This sheathing, which is made up of specially fabricated galvanized steel sheets and designed to be used in conjunction with a suitable top covering of insulating material and built-up roofing, is said to be light in weight, strong, fire-resisting, impervious to dampness, unaffected by temperature changes, and easily and economically erected.

Blawsteel sheathing consists of galvanized sheets in sizes easy to handle, with V-shaped reinforcing ribs pressed into them longitudinally on four-inch centers. These sheets are installed lengthwise on



Drawing Showing Roof Construction With Blawsteel Sheathing

the roof with the ribs downward, resting on the purlins of the roof structure, and with the flat side up. Each succeeding section of the sheathing, as laid, interlocks throughout its length with the preceding section, while the ends of the various sections are made to lap a distance of three inches; the ribs in the various pieces, as being laid, telescoping with the ribs of the sections already in place. Suitable anchors are supplied for fastening the sheathing to the roof purlins, as are also special sections of eave cornice

and ridge cap where the construction requires them.

Standard purlin spacing of 3 ft. 10½ in. is recommended in connection with Blawsteel sheathing, and with this spacing it will carry a load of 65 lb. per sq. ft., with a safety factor of four, and with less than the allowable deflection for plaster ceilings. Repeated tests have shown that the sheathing will carry 100 lb. per sq. ft. with a deflection of only 3/16 in. While standard purlin spacing is considered desirable, the sheathing is furnished in 20, 22 and 24-gage metal so that the spacing may be increased with safety if desired.

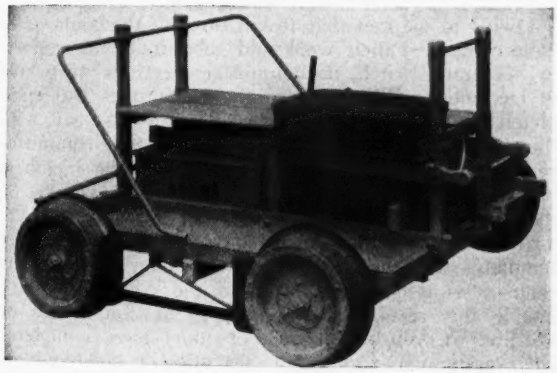
Insulation of the sheathing against heat losses or penetration can be secured to any degree desired by the application of sheet insulating material directly over it; ½ in. of this material being sufficient in most instances. Any type of built-up roofing can be applied over the insulation as a water-proof top coating.

Motor Car Embodies New Features

A CENTER-LOAD, direct-connected track motor car for inspection work has just been placed on the market by the Adams Motor & Manufacturing Company, Chicago. This new car, designated as the Series 10, has gone through a development period to test its fitness for the type of service for which it is designed, namely, for the use of inspectors, roadmasters, division engineers, supervisors and others. It will carry four men comfortably.

It has a direct-connected, air-cooled, two-cycle motor, with a 4¼-in. bore and a 4½-in. stroke. The crank shaft is mounted on Timken roller bearings and the connecting rod bearings are bronze-backed, babbitt-lined, 2 in. in diameter and 2 in. long. The piston has a full-floating wrist pin and three step-cut rings. The carburetor is a standard automobile type, and ignition is by means of battery and spark coil with an easily removable timer mounted on the main bearing housing. The engine is provided with compression relief and coaster valves and a ½-in. spark plug. It is easily accessible for all ordinary adjustments.

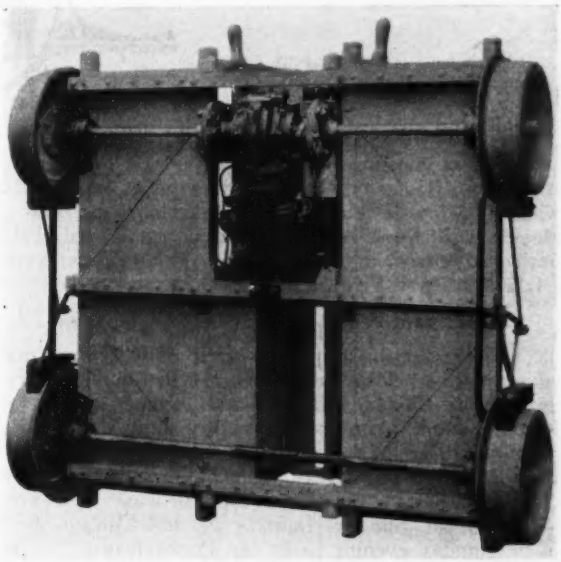
The transmission system is unusual. As seen in the illustration, the engine is mounted in such a position



The Adams Series 10 Motor Car

that the crank shaft is in exact line with the rear axle, which is in two parts that are short enough so that their inner ends just clear the ends of the crank shaft. The connection between each end of the engine shaft and the adjacent end of the axle is made with a fabric universal joint. The axles are chrome-nickel steel forgings, heat treated and finished all over. There are two opposed Timken roller bearings in each malleable iron axle box and the end thrust is taken on a shoulder between these bearings forged integral with the axle.

There are no oil or grease cups on the car. The axle boxes are lubricated with light grease, which is replenished once a year. The front axle is also in two parts, connected by a steel sleeve to give a loose wheel effect. All four wheels are alike and are tight on the axles. They have forged steel hubs, with 14-in. cone treads and



How the Engine is Mounted Between the Two Halves of the Rear Axle

wood centers for insulation. Four-wheel brakes and wheel guards are standard equipment. Skids between the wheels are provided for quick and easy removal from the track.

The frame posts and rails are made of birch and the deck boards and floor boards of fir and poplar. The seat deck for the No. 10 model is 21 in. by 53 in., with a carrying space on each side measuring 15 in. by 51 in. Pull-out handles are provided, which, when extended, require a lift of about 135 lb. While standard colors are green and black, special colors can be supplied on order. The Series 10 is made with both 42-in. and 36-in. wheel-bases, both sizes being equipped with a cushion and tool tray if desired. Although the engines of all models have Timken roller bearings, plain axle bearings can be furnished when desired in place of the Timken axle bearings as previously described.

Directory of Associations

American Railway Bridge and Building Association—C. A. Lichty, secretary, 319 North Waller avenue, Chicago. Next convention, October 15-17, 1929, New Orleans, La.

American Railway Engineering Association (Works in co-operation with the American Railway Association, Division IV).—E. H. Fritch, secretary, 431 South Dearborn street, Chicago. Next convention, March 5-7, 1929, Palmer House, Chicago.

American Wood-Preservers' Association, H. L. Dawson, secretary, 228 North La Salle street, Chicago. Next convention, January 22-24, 1929, Louisville, Ky.

Bridge and Building Supply Men's Association.—W. D. Waugh, secretary, Detroit Graphite Company, Railway Exchange Building, St. Louis, Mo. Annual exhibit at convention of American Railway Bridge and Building Association.

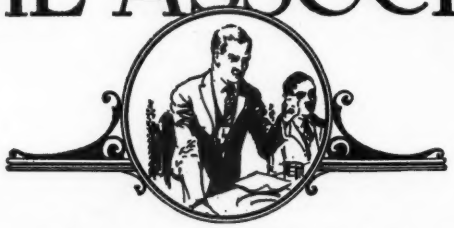
National Association of Railroad Tie Producers—Roy M. Edmonds, secretary, Syndicate Trust Building, St. Louis, Mo. Next convention, April 23-25, 1929, Arlington Hotel, Hot Springs, Ark.

National Railway Appliances Association.—C. W. Kelly, secretary, 1014 South Michigan avenue, Chicago. Annual exhibit during convention of American Railway Engineering Association.

Roadmasters' and Maintenance of Way Association.—T. F. Donahoe, secretary, 428 Mansion street, Pittsburgh, Pa. Next convention, September 17-19, 1929, Chicago.

Track Supply Association—L. C. Ryan, secretary, Oxweld Railroad Service Company, Chicago. Annual exhibit at convention of Roadmasters' and Maintenance of Way Association.

WITH THE ASSOCIATIONS



Maintenance of Way Club of Chicago

The next meeting of the club will be held at the Auditorium Hotel on Wednesday evening, January 16, when Charles A. Morse, who was chief engineer of the Chicago, Rock Island & Pacific from April, 1913, until his retirement on December 31, 1928, will give a talk on "Fifty Years' Progress in Maintenance."

American Wood-Preservers' Association

The program for the twenty-fifth annual convention, which will be held at the Brown Hotel, Louisville, Ky., on January 22-24, is rapidly approaching completion. It will include a number of papers and addresses by prominent users of treated timber, in addition to reports from various committees.

Special cars for the convention will leave New York at 1:45 p. m. Sunday, January 20, and Chicago at 11 p. m. Sunday evening, over the Pennsylvania, for Indianapolis, where Monday will be spent visiting the plants of the Republic Creosoting Company and the American Creosoting Company. These cars will then be attached to a Pennsylvania train leaving Indianapolis at 3:22 p. m., arriving at Louisville at 6:30 p. m.

Roadmasters' and Maintenance of Way Association

At a meeting of the executive committee at the Hotel Stevens, Chicago, on December 8, committees were selected to investigate and report on subjects at the next annual convention as follows:

The Selection and Training of Section Foremen—Chairman, G. T. Donahue, assistant division engineer, N. Y. C., Rochester, N. Y.; vice-chairman, P. J. McAndrews, roadmaster, C. & N. W., Sterling, Ill.; M. H. Murphy, roadmaster, C. & A., Slater, Mo.; M. A. Davidson, roadmaster, U. P., Kearney, Neb.; Z. L. Mobley, roadmaster, Sou., Alexandria, Va.; J. Kielty, roadmaster, D. L. & W., Hoboken, N. J.; A. A. Cross, assistant division engineer, N. Y. N. H. & H., Danbury, Conn.; P. Chicoine, roadmaster, C. P. R., Smith's Falls, Ont.; E. F. Manson, division engineer, C. R. I. & P., Trenton, Mo.; W. L. Spyres, roadmaster, K. C. S., Mena, Ark.

Methods of Determining and Controling Cross and Switch Tie Renewals—Chairman, L. M. Denny, supervisor, C. C. C. & St. L., Indianapolis, Ind.; vice-chairman, B. H. Briggs, general tie inspector, B. R. & P., Springville, N. Y.; B. F. Hanna, supervisor, B. & O., Rockwood, Pa.; C. H. Shrier, general inspector roadway and track, A. T. & S. F., Topeka, Kan.; L. Coffel, supervisor, C. & E. I., Momence, Ill.; P. Quinlivan, roadmaster, D. L. & W., Buffalo, N. Y.; W. O. Frame, district engineer maintenance of way, C. B. & Q., Burlington, Ia.; J. B. Martin, general inspector of track, N. Y. C., Cleveland, Ohio; W. T. Taylor, supervisor, Michigan Central, Welland, Ont.; I. D. Talmadge, roadmaster, N. Y. O. & W., Middletown, N. Y.; C. F. Nelson, general cost engineer, N. P., Livingston, Mont.; C. S. Dodson, roadmaster, St. L. S. W., Mt. Pleasant, Tex.; R. L. Kittredge, cost engineer, Hocking Valley, Columbus, Ohio; W. A. Dibble, supervisor of track, N. Y. C., LaPorte, Ind.

Develop Standards of Good Workmanship in Laying Rail and Recommend Methods of Insuring Adherence to These Standards—Chairman, C. W. Baldridge, assistant engineer, A. T. & S. F., Chicago; vice-chairman, W. Shea, general roadmaster, C. M. St. P. & P., Chicago; W. F. Monahan, general track inspector, S. P., San Francisco, Cal.; W. A. Clark, supervisor, Reading, Trenton Junction, N. J.; H. A. Halverson, roadmaster, C. & N. W., Wall Lake, Iowa; W. H. Sparks, general inspector of track, C. & O., Russell, Ky.; F. J. Liston, roadmaster, C. P. R., Trois Rivers, Que.; G. G. Hewitt, roadmaster, Sou., Winston-Salem, N. C.; A. E. Muschott, roadmaster, E. J. & E., Joliet, Ill.; R. M. Cunningham, general roadmaster, Erie, Hornell, N. Y.; S. W. Cralle, roadmaster, N. & W., Petersburg, Va.

The Detection and Correction of Unsafe Methods in Track Work—Chairman, G. H. Warfel, assistant to general manager, U. P., Omaha, Neb.; vice-chairman, K. Hammann, assistant engineer maintenance of way, L. I., Jamaica, N. Y.; O. Supernant, roadmaster, D. & H., Schenectady, N. Y.; E. P. Safford, supervisor, N. Y. C., Silver Creek, N. Y.; J. J. Gallagher, roadmaster, M.-K.-T., Boonville, Mo.; J. P. Corcoran, roadmaster, C. & A., Bloomington, Ill.; J. Shea, roadmaster, D. & I. R., Two Harbors, Minn.; W. A. Enderle, roadmaster, S. P., San Antonio, Tex.; D. J. Vallier, supervisor, B. & M., Boston, Mass.; W. E. Carter, supervisor, B. & L. E., Greenville, Pa.; W. P. Clear, supervisor, C. G. W., Carroll, Iowa; and M. M. Barrett, supervisor, N. Y. N. H. & H., Middleboro, Mass.

Methods and Costs of Weed Control and Elimination—Chairman, A. Chinn, engineer maintenance of way, C. B. & Q., Lincoln, Neb.; M. Duberstein, chief clerk engineer maintenance, C. & N. W., Chicago; F. W. Easton, roadmaster, S. P., Ogden, Utah; J. T. Crump, cost engineer, C. & O., Richmond, Va.; B. E. Haley, general roadmaster, A. C. L., Lakeland, Fla.; G. G. Smart, general supervisor of work equipment, G. N., St. Paul, Minn.; T. L. Hoffmeister, supervisor, Pa., Ashtabula, Ohio; W. C. Pruett, district engineer, M.-K.-T., Waco, Tex.; C. F. Allen, division engineer, C. M. St. P. & P., Milwaukee, Wis.; W. M. Anderson, roadmaster, S. A. L., Birmingham, Ala.; J. B. Mackenzie, district engineer, C. N. R., Toronto, Ont.; D. B. Clark, general roadmaster, F. E. C., St. Augustine, Fla.; C. M. Hayes, assistant general roadmaster, M. St. P. & S. S. M., Minneapolis, Minn.; and W. F. Murray, division engineer, M. P., Coffeyville, Kan.

American Railway Engineering Association

Owing to the fact that all but three of the committees have completed their work and submitted their reports to Secretary Fritch, no committee meetings were held in December. The work of the committees was completed earlier this year than in any previous year, with the result that one bulletin containing five committee reports has already been distributed to the members and another bulletin with five more reports is now on the press.

An innovation that will be introduced this year contemplates that the committees will undertake work on their new assignments prior to the convention. To enable this result to be achieved, the committees on Outline of Work and on Personnel have completed their assignments and they are now in the hands of the printer, with the expectation that they will be distributed to the members by January 15. The magnitude of this innovation is indicated by the fact that these assignments were not available until the convention last year and prior to 1928 were normally not completed until April. Indicative of the promptness with which the committees are undertaking their work, two committees—Water Service and Yards and Terminals—have already called meetings for January, while several other meetings are in contemplation.

RAILWAY NEWS BRIEFLY TOLD

During the heavy rains which resulted in floods in the rivers in Eastern Kansas between November 17 and 20, causing washouts on the railways in that territory, the United States Weather Bureau station at Paola, Kan., reported a total precipitation of 10.46 in. in 35 hrs.

A broken rail caused the derailment of the "Sunshine Special" on the International-Great Northern between Prices, Tex., and Neches, on December 23, derailing and overturning nine cars, and causing the death of one passenger, together with the injury of 27 other persons. The rail that broke was of 85-lb. section, laid in 1919, and the trouble was attributed to an internal transverse fissure.

A slow order issued on the St. Louis-San Francisco at Sapulpa, Okla., on April 20, 1902, read as follows: "Run slow and carefully between Holdenville and Ada, Okla., looking out for obstructions on track and track torn up by hostile Indians." The order was occasioned by the fact that 400 Seminole Indians under the leadership of Chief Crazy Snake were on the warpath at the time.

The Interstate Commerce Commission has modified its rules relative to the reporting of railway accidents, effective January 1, to require the railways to report to it by telegraph any collision or derailment resulting in the death or serious injury of one or more persons, including any collision with a motor vehicle at a grade crossing resulting in the death or serious injury of any passenger, employee or other person riding on the train involved.

The total number of employees on the Class I railways as of the middle of September, 1928, as reported to the Interstate Commerce Commission was 1,722,820, and their total monthly compensation was $239,632,975. These figgures represent a decrease of 64,949 employees, or 3.69 per cent as compared with the returns for the corresponding month in 1927, while the decrease in compensation was $9,261,694 or 3.79 per cent. Of the total decrease in employees, 15,312 or 23.6 per cent were in the maintenance of way and structures group.

The Chicago & North Western safety department has organized a safety committee of 6,500 employees, composed of 10 per cent of the employees of each department of the system. Each member is known as a field representative, whose duty it is to aid other employees and to report to the superintendent of safety at Chicago, cases in which employees have acted carelessly or have endangered their own lives or those of others. The field representatives do not report the names of the persons assisted or of the violators of the safety rules, but send a card to the safety department showing the number of times they have called attention to acts which might have resulted in injury.

The Public Service Commission of the State of New York has designated 139 additional projects, involving the elimination of 246 grade crossings, for consideration during 1929. The total cost of these eliminations is estimated at $31,123,700, of which the state's share will be $12,449,480, that of the counties in which the crossings are located, $3,-112,370, and that of the railways, $15,-561,850. There were also continued on the 1929 program 33 elimination projects, involving 54 grade crossings, which were under consideration in 1928, but upon which no decision had been made. The total estimated cost of these projects is $8,391,000. The number of projects, together with the railways' share of the cost for several of the larger roads are as follows: New York Central, 41, at a cost of $5,173,-500; Delaware & Hudson, 19, at a cost of $1,176,400; Erie, 19, at a cost of $1,-491,400; Lehigh Valley, 13, at a cost of $1,185,500, and Long Island, 12, at a cost of $3,436,500.

Stabilization of employment can be "more surely promoted by a state of mind reflecting a conscious desire to stablize employment than by anything else," according to the testimony of Daniel Willard, president of the Baltimore & Ohio, and chairman of the Special Committee of Stablization of Railway Employment of the Association of Railway Executives, at a hearing before the Senate committee on education and labor, which is investigating the unemployment situation. Mr. Willard outlined the efforts made by the railways in their efforts to reduce the seasonal fluctuations in railway employment. He pointed out that the number of transportation employees must vary with the volume of business, but that much had been done in the distribution of maintenance work and that keeping a more steady force had been a good thing for the railways. He emphasized, however, that the railways are hampered in their efforts, to some extent, by the fact that their earnings are restricted and that the Interstate Commerce Commission has not yet allowed rates sufficient to produce a fair return. J. T. Loree, vice-president and general manager of the Delaware & Hudson, who also testified, described the progress made by that company in planning and distributing its work to reduce seasonal fluctuations in labor.

The Northern Pacific has just received from the builders the largest steam locomotive in the world, with a total weight of 1,116,000 lb., of which 715,000 lb. is the weight of the engine, and 401,000 lb. is the weight of the tender. The engine is of the single-expansion articulated 2-8-8-4 type, with 554,000 lb. on the drivers, and has a tractive force of 139,900 lb. The overall length between couplers is 124 ft. 11⅝ in. The engine will be placed in service between Mandan, N. D., and Glendive, Mont., where the maximum grades are 1.1 per cent, and if its performance is satisfactory in hauling 4,000-ton trains in this territory in place of 2,250-ton trains now handled by 2-8-2 engines, other locomotives of the same kind will be purchased.

L. G. Bentley, chairman of the Committee on Education of the Safety Section of the A. R. A., has issued circular No. 212, proposing a schedule for the activities of safety committees during the month of January, and calls attention to the fact that the railways are entering the sixth year in the campaign to reduce casualties 35 per cent by the end of 1930. Inspiration for further efforts is shown in the records of total casualties to employees, the total of 153,900 in 1923 comparing with 89,058 in 1927, with a prospect of not more than 70,000 in 1928. Mr. Bentley repeats, in condensed form, the principles and methods which have been pursued successfully in the past as follows:

1. Safety work must have approval of the highest officer.
2. Causes of accidents should be removed before, rather than after, the accident occurs.
3. Personal injuries should be investigated by special committees.
4. Get injured men back to work as they are able, but exercise good judgment and have the co-operation of the surgical department.
5. Contests between different divisions and operating units have proved of great value.

Construction News

The Atchison, Topeka & Santa Fe and the State Highway Commission have been authorized by the California Railroad Commission to construct a grade separation structure to carry the Los Angeles - Santa Ana - San Diego highway over the tracks of this railroad at Irvine, Cal.

The Interstate Commerce Commission has authorized the Cane Belt Railroad, a subsidiary, to construct a thirty-five mile line from near Lane City, Texas, to Thompsons, estimated to cost $1,400,000.

The Bartlett Western has prepared plans for the construction of an extension from Bartlett, Tex., to Cameron, 35 miles.

The Birmingham, Selma & Northern has been authorized by the Interstate Commerce Commission to extend its line from Jericho in a southeasterly direction, to Joyce Hill, Ala., 10 miles, and to construct a branch line 22 miles west and northwest from Jericho at an estimated cost of $174,832.

The Birmingham Southern plans the expenditure of $170,000 in connection with the construction of a grade-separation project at Birmingham, Ala. It will include the raising of tracks and the rearrangement of yard tracks and connections with other railroads.

The Canadian North-Eastern plans the complete reconstruction of its present line from Stewart, B. C., at the head of the Portland Canal near the boundary between Alaska and Canada, through the Bear River valley, 15 miles, and in 1929 will make location surveys for the construction of extension from Stewart to the Peace River country and to the northerly boundary of British Columbia, which will tap mineral resources. As projected eastward, the line will pass through the Ground Hog coal fields, about 125 miles from Stewart, the Ingenika district, about 200 miles from Stewart, finally reaching the Peace River district.

The Canadian Pacific has agreed to contribute $100,000 toward the cost of constructing the proposed Burrard Street bridge over False creek at Vancouver, B. C., which will provide a railroad crossing of the creek on the lower deck as a substitute for the present Kitsilano trestle. The provincial government has agreed to contribute $200,000 of the cost. The total cost of a double-deck railway and highway bridge, which will be about 2,700 ft. long, is estimated at $3,180,000.

The Chicago, Rock Island & Pacific has awarded a contract to A. Guthrie & Co., Inc., St. Paul, Minn., for the construction of an extension from Gruver, Tex., to Liberal, Kan., 56 miles, contingent upon the passage by the City of Liberal of a bond issue which will provide the railroad with a right-of-way from Liberal to Beaver Creek.

The Dayton Union will elevate its tracks in the vicinity of the Union Station at Dayton, Ohio. The cost of the elevation, which will eliminate grade crossings at South Wayne avenue and East Third, East Fifth, Wyandotte, Stone, South Jefferson, South Main, South Ludlow and South Perry streets, will be approximately $7,500,000.

The Great Northern is preparing for the construction in 1929 of second main track between Williston, N. D., and Snowden, Mont., 26 miles at a total cost of about $1,100,000. It is also planned to replace the wooden coaling station and water tank at Williston with steel structures and make other terminal and yard improvements at that point, at an estimated expenditure of more than $100,000. Authorization has been given for the construction of a six-stall addition to the roundhouse and the construction of a new coaling station at Whitefish, Mont., at a cost of about $100,000.

The Hudson Bay Railway has awarded a contract for the construction of a branch line from Cranberry Portage on the Flin Flon line to the Sherrit Gordon Mine in northern Manitoba to the Dominion Construction Company and Tomlinson & Co., who built the Flin Flon line.

The Illinois Traction System has been authorized by the Missouri Public Service Commission to construct its proposed freight and passenger terminal at Twelfth boulevard and Lucas avenue, St. Louis, Mo.

The Indianapolis Union, in accordance with an agreement with the Indianapolis (Ind.) Board of Public Works, was ordered by that body, on December 10, to proceed with its track elevation, which is expected to involve a total expenditure of $10,000,000. The project calls for the elevation of tracks from West New York street to English avenue, about 6 miles.

The Lehigh Valley is planning the elimination of a grade crossing on its line at Hillside, N. J. The project will include the construction of a bridge approximately 135 ft. long and 40 ft. wide, to accommodate both highway and pedestrian traffic.

The Los Angeles & Salt Lake plans the construction of a combined railway and motor coach passenger station at Atlantic boulevard and Telegraph road, East Los Angeles, Cal., about 6 miles from the Central Station, Los Angeles. The architecture of the station will be of the Spanish type, both exterior and interior, and will involve an expenditure of about $100,000. It is designed to serve as a through station.

A contract has been awarded to the Cherdron Construction Company for the construction of a six-stall 105-ft. brick and frame roundhouse addition at Los Angeles, the dismantling of 17 stalls, 85-ft. long, and the construction of auxiliary buildings. The total expenditure for this work is estimated at $83,000.

The Los Angeles Harbor Board has awarded a contract to B. W. Hicks, Los Angeles, Cal., for grading the right of way for a connection between the Atchison Topeka & Santa Fe at Wilmington and the harbor works of Los Angeles. Bids were opened on Dec. 5 for the construction of abutments for a viaduct to carry the line over a boulevard.

The Louisville & Nashville has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 500-ton capacity reinforced concrete shallow pit automatic electric coaling station, a gravity sanding plant and two electric cinder plants at Sibert Yard, Mobile, Ala.

The Missouri-Kansas-Texas plans the construction in 1929 of a 10-stall roundhouse at Fort Worth, Tex., which will complete the program of improved facilities at that point. The cost of the roundhouse will be about $405,000. On the Henrietta division, between Whitesboro, Tex., and Wichita Falls, it is planned to make line and grade revisions which will involve an expenditure of about $400,000.

The Missouri Pacific has awarded a contract to the Blaser-Bollmer Construction Company, Wichita, Kan., for the construction of a one-story power house, which will have dimensions of 38 ft. by 40 ft., at Wichita, Kan. A contract for the construction of a one-story hostlers and engine-supplies building with dimensions of 16 ft. by 48 ft. at East Bottoms, Kansas City, Mo., has been let to E. L. Winn, Kansas City. A contract has also been let to Fairbanks, Morse & Co., Chicago, for the construction of a reinforced concrete direct coaling station with a 50 tons receiving hopper at Arkansas City, Kan.

This company contemplates the construction of a freight station, which will have outside dimensions of 28 ft. by 256 ft., adjacent to the passenger station at the Central Avenue viaduct, Kansas City, Mo., and accompanying trackage facilities. The cost of this work will approximate $81,000.

The New York Central has awarded five contracts for work on its lines in New York state as follows: Construction of a coach shop at Buffalo, to Frank G. Hanssel, Buffalo, N. Y.; grading and paving on Twelfth avenue, New York, to William J. Fitzgerald, New York; elimination of a grade crossing at Martindale, to William M. Ballard, Inc., Syracuse, N. Y., repairing and strengthening Pier 1 at 70th street, New York, to John C. Guise, Inc., New York, and the extension of platforms, canopies and shelter sheds at Harmon, to Miller-Blyth, Inc., New York.

The Pennsylvania has awarded a contract to the Foundation Company, New York, for the building of the masonry substructure for the bridge which it is constructing jointly with the State of New Jersey at Marion, N. J. This contract will involve an expenditure

estimated at approximately $1,600,000.

A contract for the laying of track on its Newark Bay bridge and approaches at Greenville, N. J., has been awarded to Henry Steers, Inc., New York. The total cost for the work will be about $65,000. A second contract, for the construction of a subway under the Dix-Toledo highway, at Lincoln Park, Mich., at a cost of about $50,000, has been given to the Mark R. Hanna Co., Detroit, Mich., while a third, calling for the reconstruction of an overhead bridge at Harvard avenue, Cleveland, O., at an approximate cost of $40,000, has been awarded the Stevens Construction Co.

The Prince George & Chesterfield has been authorized by the Interstate Commerce Commission to construct an extension, 16 miles in length, between Bellwood and Hopewell, Va. The project will also include the laying of approximately four miles of yard tracks, sidings, etc. The total cost is expected to be about $1,000,000.

The St. Louis & Hannibal plans the construction of a machine shop at Hannibal, Mo., to replace facilities that were recently destroyed by fire.

The Telkwa-Kitimat has made application for incorporation in the Province of British Columbia and will ask the next session of the provincial legislature for permission to construct a railway from Telkwa, B. C., through Copper City to Kitimat arm on the Pacific coast in order to develop coal areas and other natural resources.

The Texas & Pacific has filed an application with the State Corporations Commission of New Mexico for the construction of a line from the southern boundary of New Mexico through Lea County to Lovington, N. M., about 65 miles. This line would constitute an extension of the Texas-New Mexico which is now under construction from Monahans, Tex., to the Texas-New Mexico state line.

The Union Pacific has been authorized by the Utah Public Utilities Commission to construct two highway subways under its tracks near Uintah, Utah. The cost of the two grade separation structures, half of which will be borne by the railroad, will be $41,300 and $20,650.

The Virginian has awarded contracts for the construction of 16½ miles of new track on its line between Itmann and a point about 7 miles west of Pineville in W. Va., as follows: Eleven and one-half miles to the Walton Sudduth Co., Bluefield, W. Va., and 5 miles to Waugh Brothers, Inc., Fayetteville, W. Va. The total length of this new project planned by the Virginian in the Guyandot river valley is 41.9 miles, between Itmann and Gilbert, W. Va. Approximately $535,000 is involved in the foregoing contracts.

The Yates & West Texas proposes the construction of a railroad from Rankin, Tex., on the Kansas City, Mexico & Orient, south to Iraan, Tex., 30 miles, in the Yates oil field.

Supply Trade News

General

The Johns-Manville Corporation, New York, has purchased the assets and the entire line of products of the Celite Products Company, Los Angeles, Cal. This transaction will bring to the Johns-Manville Corporation an annual business of over $4,000,000 in net sales, of high-temperature insulation and allied lines, made from diatomaceous earth, a fossilized product derived from ancient sea life. These deposits, which were owned by the Celite company, are the largest known sources of this material. In addition, the Celite company was a large producer of filtration materials as well as of Celite, for use in concrete, and the Johns-Manville Corporation will continue to develop these activities.

Personal

Robert M. Knox, general superintendent of A. Guthrie & Co., Inc., St. Paul, Minn., with headquarters at Chicago, has been elected vice-president of

Robert M. Knox

that organization. Mr. Knox was born on March 27, 1881, at Belfast, Ireland, and came to the United States when 13 years old. He entered the employ of A. Guthrie & Co. as a timekeeper in 1898, and since that time has been engaged in railroad construction in the western states and in Canada, serving successively as foreman, general foreman, assistant superintendent, superintendent and general superintendent, being advanced to the last-named position in 1916. During the World War, Mr. Knox was a captain in the Seventieth and later in the Seventy-fifth Engineers.

J. W. Fristoe, president and general manager of the T. J. Moss Tie Company, St. Louis, Mo., has been elected chairman of the board and **E. E. Pershall,** vice-president, has been elected president to succeed Mr. Fristoe, **John S. Penny,** general superintendent of treating plants, has been elected vice-president to succeed Mr. Pershall.

Mr. Fristoe was born on November 13, 1858, at Salisbury, Mo., and in 1879 became connected with the Rennolds & Moss Company, which became the T. J. Moss Tie Company in 1893. After

J. W. Fristoe

holding various positions with these companies, Mr. Fristoe was elected president and general manager in 1902, which position he held until his recent election as chairman of the board. His retirement to less active duties was prompted by a desire to devote more time to civic work in St. Louis.

Mr. Pershall was born on August 17, 1887, at East St. Louis, Ill., and was educated in chemical engineering at the University of Illinois. He entered business on July 16, 1910, with the Kettle River Treating Company and on February 1, 1918, became assistant to the president of the T. J. Moss Tie Company. He was promoted to vice-

E. E. Pershall

president in the following year, which position he was holding at the time of his recent election as president.

Mr. Penny graduated from Westminster College at Fulton, Mo., in 1911, and immediately thereafter entered the employ of the Kettle River Treating Company, with whom he remained until 1920, with the exception of about two years, when he was in charge of the construction of a treating plant for the Central Creosoting Company at Finney, Ohio. Mr. Penny became superintendent of treating plants for the T. J. Moss Tie Company in 1920

and was general superintendent of treating plants at the time of his recent advancement to vice-president.

Frank C. Powers, Chicago representative of the Kentucky Rock Asphalt Company, Louisville, Ky., was killed in an automobile accident near Louisville on November 17.

Wilmer Cordes, assistant manager of the advertising department of the American Steel & Wire Company, with headquarters at Chicago, who has been acting as manager since the retirement of **B. B. Ayres** on March 31, has been promoted to manager of the advertising department.

W. H. Allen has been appointed eastern sales agent for the Sellers Manufacturing Company, Chicago, with headquarters at 50 Church street, New York, to succeed **E. W. VanHouten,** who has resigned.

W. A. Brownfield, chief engineer of the Kentucky Rock Asphalt Company, was lost at sea on November 12, as a result of the sinking of the steamer Vestris, on which he was making a business trip to South America. Mr. Brownfield was born at Tonieville, Ky., and graduated from the Kentucky State University in 1911. After completing his education, he became an assistant engineer on the Louisville & Nashville, in charge of the construction of yards and terminals, and in 1915 be-

W. A. Brownfield

came an assistant engineer on the staff of the president of the Nashville, Chattanooga & St. Louis, in which position he was engaged in commercial reconnaissance. From 1915 to 1917 he was an inspector in the Kentucky State Highway Department, and from the latter year to 1919, he was in the service of the government. He was president of the Hardin Oil Company of Kentucky during 1920 and 1921 and was city engineer of Providence, Ky., during portions of 1921 and 1922. In the latter year he entered the service of the Kentucky Rock Asphalt Company as an assistant engineer and in 1923 was promoted to chief engineer, which position he was holding at the time of his death.

Trade Publications

Quality Concrete.—Bulletin No. 340 issued by the Celite Products Company, Los Angeles, Cal., treats of the workability of concrete as affected by Celite and describes the methods by which the relative degree of workability of concrete mixes can be measured.

Zinc Meta-Arsenite.—A booklet containing a technical discussion of zinc meta-arenite and other subjects of interest to those concerned with timber preservation, has been issued by the Curtin-Howe Corporation, timber preservation engineers, 11 Park Place, New York City.

Sullivan Portable Electric Hoists.—The Sullivan Machinery Company, Chicago, in Bulletin 76-J which it has recently issued, describes its portable electric hoists, which are made in double-drum types for scraper-loading or dragline work and in single drum types for general utility purposes.

Multi-Wall Paper Bags for Cement.—The Bates Valve Bag Corporation, Chicago, has issued a 12-page pamphlet entitled "From Mill to Mixer," in which attention is called to the protection afforded cement and plaster when shipped and stored in the paper bags manufactured by that company.

American Supply Train Crane.—The American Hoist & Derrick Company, St. Paul, Minn., has issued a folder describing and illustrating the gasoline crane it has developed for use in connection with supply train service. The crane is equipped with a lifting magnet and can also be used to operate buckets or hoisting slings.

Inland Copper Alloy Steel Sheets.—The Inland Steel Company, Chicago, has issued a 32-page illustrated booklet describing the copper-bearing steel sheets which it manufactures. The value of copper alloy as a protection against corrosion is stressed and the results of the corrosion tests made at Ft. Sheridan, Ill., by the American Society for Testing Materials are given.

New "N & W" Type Engine Coaler.—Bulletin No. 111, issued by the Roberts & Schaefer Company, Chicago, describes and illustrates the electrically-operated engine coalers manufactured by that company. Besides reproductions of photographs of installations made on various roads, the bulletin contains line drawings of typical layouts, including a combined plant for handling both coal and cinders.

Chicago Pneumatic Compressors and Semi-Diesel Engines.—The Chicago Pneumatic Tool Company, New York, has recently issued three bulletins describing that company's products. Bulletin No. 700 (third edition) is devoted to air compressors; Bulletin No. 720 (fifth edition) to straight-line air and gas compressors, and Bulletin No. 773 (second edition) to Giant Semi-Diesel oil engines in sizes from 30 to 100 b.h.p.

Personal Mention

General

Robert E. Woodruff, general manager of the Eastern region of the Erie, with headquarters at Hornell, N. Y., and an engineer by training and experience, has been promoted to assistant vice-president, with headquarters at New York. Mr. Woodruff was born in 1884 at Green Bay, Wis., and was educated at Purdue University. He entered railway service in 1905 as a section laborer on the Erie and thereafter served successively as track foreman,

Robert E. Woodruff

constuction engineer, division engineer at Meadville, Pa., and trainmaster until March, 1909, when he was promoted to general agent of the operating department at Chicago. He was appointed superintendent at Rochester, N. Y., in November, 1910, and later was promoted successively to superintendent of transportation, general superintendent of the Lines West, manager of the Hornell region and general manager of the Eastern district. His promotion to general manager took place in February, 1927, and he was occupying that position at the time of his recent advancement to assistant vice-president.

Frank L. Burckhalter, first assistant general manager of the Pacific lines of the Southern Pacific, an engineer by education and experience, has been promoted to general manager, with headquarters as heretofore at San Francisco, Cal., and the office of first assistant general manager has been discontinued. Mr. Burckhalter was born at Truckee, Cal., in 1879 and graduated from the University of California in 1900. He entered railway service in the latter year as a rodman on the Southern Pacific, and served successively as levelman, computor on location, assistant engineer, section foreman and roadmaster until March, 1906, when he was promoted to division engineer at Bakersfield, Cal. He was later transferred to Los Angeles, Cal., and in November, 1911, was promoted to district engineer with headquarters at Portland, Ore. Mr. Burckhalter en-

tered the operating department on March 1, 1914, as superintendent of the Portland division. He was promoted to assistant general manager on September 1, 1918, and to first assistant

Frank R. Burckhalter

general manager on June 1, 1925, which latter position he was holding at the time of his promotion to general manager on January 1.

Engineering

W. S. Broome has been appointed engineer of the Trinity & Brazos Valley, with headquarters at Houston, Tex.

G. M. Davidson, industrial engineer of the Chicago & North Western, with headquarters at Chicago, retired on January 1.

W. A. Parker, division engineer on the Union Pacific, with headquarters at Marysville, Kan., has retired under the pension rules of that road, following a leave of absence on account of sickness.

A. E. Bechtelheimer, general inspector of Bridges of the Chicago & North Western, with headquarters at Chicago, has been promoted to assistant engineer of bridges, with headquarters at the same point.

C. G. Welsh has been appointed assistant engineer on the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., to succeed **J. J. Davis,** whose promotion to supervisor of track is noted elsewhere in this issue.

H. J. Weccheider, general roadmaster of the Western district of the Erie, with headquarters at Youngstown, Ohio, has been promoted to division engineer of the Meadville division at Meadville, Pa., succeeding **F. D. Lakin,** resigned. A sketch of Mr. Weccheider's railway experience was published in the April, 1928, issue at the time of his promotion to general roadmaster.

G. J. Adamson, assistant chief engineer of the Union Pacific Railroad, with headquarters at Omaha, Neb., **B. H. Prater,** assistant chief engineer of the Oregon Short Line, with headquarters at Salt Lake City, Utah; **Samuel Murray,** assistant chief engineer of the Oregon-Washington Railroad & Navigation Company, and **R. L. Adamson,** assistant chief engineer of the Los Angeles & Salt Lake, with office at Los Angeles, have been appointed chief engineers of their respective units of the Union Pacific System. These are newly created titles to supersede the former titles of assistant chief engineer.

William H. Petersen, engineer maintenance of way of the First district of the Chicago, Rock Island & Pacific, with headquarters at Des Moines, Ia., has been promoted to chief engineer of that road and the Chicago, Rock Island & Gulf, with headquarters at Chicago, to succeed **Charles A. Morse,** notice of whose retirement on January 1 will be found elsewhere in these columns. **A. C. Bradley,** division engineer of the Illinois division, with headquarters at Rock Island, Ill., has been promoted to engineer maintenance of way of the First district, with headquarters at Des Moines, to succeed Mr. Petersen. **Dave Ruhl** has been appointed acting division engineer of the Chicago Terminal division to succeed **T. P. Warren,** who has been transferred to the Nebraska-Colorado division at Fairbury, Neb., to succeed **F. J. Nugent,** who has been transferred to the Iowa division at Des Moines, succeeding **F. W. Thompson,** who has been transferred to the Illinois division at Rock Island to succeed Mr. Bradley.

Mr. Petersen was born in 1867 at Appleton, Wis., and was educated at the University of Wisconsin, where he graduated in 1889. He entered railway service in June, 1889, as a rodman on the Chicago & North Western, and from March, 1890, to November, 1891, was instrumentman and resident engi-

William H. Petersen

neer on lines which are now parts of the Northern Pacific and the Great Northern. He returned to the North Western as instrumentman in March, 1892, and in May, 1893, was appointed assistant engineer on the Fremont, Elkhart & Missouri Valley (now a part of the North Western) and later was promoted to general foreman of bridges and buildings at Fremont, Neb. He entered the service of the Union Pacific in June, 1898, where he was successively supervisor of bridges and buildings and division engineer at Cheyenne, Wyo., and assistant superintendent at Cheyenne and Ellis, Kan. Mr. Petersen was appointed bridge engineer of the Rock Island, with headquarters at Chicago, in 1906, and three years later was promoted to principal assistant engineer, with headquarters in the same city.

Charles A. Morse

In 1911 he was promoted to engineer maintenance of way of the First district, with headquarters at Des Moines, Iowa, which position he was holding at the time of his promotion to chief engineer on January 1.

Charles A. Morse, chief engineer of the Chicago, Rock Island & Pacific, and the Chicago, Rock Island & Gulf, with headquarters at Chicago, retired on January 1 after 48 years' railway service, of which 15 years were spent with the Rock Island and 27 years with the Atchison, Topeka & Sante Fe. Mr. Morse was born on January 1, 1859, at Bangor, Me., and graduated from the University of Maine in 1879. He entered railway service in the following year as a chainman on the Chicago, Burlington & Quincy, and later served as instrumentman and office man. In November, 1881, he became a division engineer on the Mexican Central (now a part of the National Lines of Mexico) and in 1884 returned to the Burlington. Mr. Morse entered the service of the Atchison, Topeka & Santa Fe in January, 1886, as a transitman and later was promoted to division engineer at Ft. Madison, Iowa, afterwards being transferred to Pueblo, Colo., as resident engineer. In July, 1901, he was promoted to assistant to the chief engineer at Topeka, Kan., and from February, 1902, to November, 1909, he was successively principal assistant engineer at La Junta, Colo., engineer of the Eastern Grand division at Topeka, acting chief engineer of the coast lines at Los Angeles, Cal., and chief engineer of the lines east of Albuquerque at Topeka. In November, 1909, Mr. Morse was promoted to chief engineer of the system with headquarters at Topeka, where he remained until April, 1913, when he was appointed chief engineer of the Rock Island, in which position he remained until his retirement, except during the period of federal control of

the railroads, when he was assistant director of operation in charge of engineering and maintenance of way for the United States Railroad Administration from September, 1918, to June, 1919, during which time he also served as a member of the Board of Review of the construction division of the war department. Mr. Morse has long taken an active part in engineering society work, having served as president of the American Railway Engineering Association in 1918-1919, as president of the Western Society of Engineers, Chicago, in 1923-1924, and as president of the Chicago Engineers Club in 1918.

M. F. Longwill, whose promotion to chief engineer of the Wabash was noted in the December issue, was born on February 13, 1885, at Indiana, Pa., and graduated from Ohio Northern University in 1906. He entered railway

M. F. Longwill

service in the latter year in the engineering department of the Missouri Pacific, and after holding various positions, was promoted to roadmaster at Carthage, Mo., in 1909. He was further promoted to assistant division engineer at Sedalia, Mo., in 1910, and to assistant engineer at the same point in 1911. In 1915, Mr. Langwill became a resident engineer on the Union Railway at Memphis, and in 1918, he was appointed division engineer on the Wabash, with headquarters at Montpelier, Ohio. He was promoted to assistant chief engineer, with headquarters at St. Louis, in October, 1923, and to assistant to the president in January, 1926, which latter position he was holding at the time of his promotion to chief engineer on December 1.

Albert A. Cross, track supervisor on the New York, New Haven & Hartford, whose promotion to assistant division engineer, with headquarters at Danbury, Conn., was noted in the December issue, was born on November 2, 1890, at New Britain, Conn., and graduated from the Sheffield Scientific School of Yale University in 1914. Mr. Cross entered railway service as a rodman on the New Haven division of the New Haven in August, 1914, and in October, 1915, he was promoted to inspector. In January, 1917, he was promoted to transitman and served in that capacity until June of that year, when he was promoted to assistant engineer on the New Haven division. Mr. Cross left railway service in July, 1919, to enter the employ of the Aberthaw Construction Company, and later he was employed in the engineering department of the Stanley Works at New Britain, Conn. In February, 1921, he returned to the New Haven as a transitman on the Old Colony division, and from June, 1922, to December, 1923, he served as cost engineer on the New London division. In December, 1923, he was promoted to assistant track supervisor at Poughkeepsie, N. Y., and in April, 1924, he was promoted to track supervisor at Framingham, Mass. In October, 1926, he was transferred to Putnam, Conn., where he served until his recent promotion to assistant division engineer.

D. A. Young, whose appointment as chief engineer of the Indiana Harbor Belt was given notice in the December, 1928, issue, was born on March 3, 1876, at Chicago, and entered railway service in the summer of 1895 as a material man on construction on the Toronto, Hamilton & Buffalo at Welland, Ont., where he remained about 1½ years, when he entered the service of the Chicago, Hammond & Western (now a part of the Indiana Harbor Belt) in the same capacity. From 1898 to 1902, he was with the Chicago, Rock Island & Pacific on location and construction in Iowa and the Southwest, where he was successively chainman, rodman, levelman and resident engineer. In 1922, Mr. Young became resident engineer on the Eastern Oklahoma (now a part of the Atchison, Topeka & Santa Fe). In 1904, he was a resident engineer for the South Park Commission of Chicago on the construction of small parks, and the following year became office engineer on construction and maintenance on the Indiana Harbor Belt from Chicago to Danville, Ill. In 1907, he entered the service of the Engineering Construction Company, Chicago, and in 1915, re-entered railway work in the valuation department of the Chicago, Milwaukee & St. Paul. In 1918, Mr. Young was appointed assistant valuation engineer of the Chicago Junction with headquarters at Union Stock Yards, Chicago, and later was promoted to valuation engineer, with headquarters at the same point.

Changes on the Pennsylvania

W. D. Supplee, supervisor on the New York division of the Pennsylvania, with headquarters at New York, has been promoted to division engineer of the Logansport division with headquarters at Logansport, Ind., to succeed **J. C. White,** who has been transferred to the New York division, with headquarters at Jersey City, N. J., to succeed **R. S. Stewart,** whose promotion to engineer maintenance of way of the Philadelphia Terminal division, with headquarters at West Philadelphia, Pa., was noted in the December issue. **C. G. Grove** supervisor on the Eastern division, with headquarters at Wooster, Ohio, has been promoted to division engineer of the St. Louis division, with headquarters at Terre Haute, Ind., to succeed **C. E. Adams,** who has been transferred to the Philadelphia Terminal division, with headquarters at West Philadelphia, Pa., succeeding **F. M. Hawthorne,** whose promotion to engineer maintenance of way was noted in the December issue. **E. H. May,** assistant to the division engineer of the Ft. Wayne division, with headquarters at Ft. Wayne, Ind., has been promoted to assistant engineer in the office of the chief engineer maintenance of way of the Western region at Chicago. **D. P. Beach,** formerly division engineer of the Indianapolis division of the Pennsylvania, has been promoted to engineer maintenance of way of the Central Pennsylvania division, with headquarters at Williamsport, Pa., to succeed **Elmer Irving,** who has been assigned to special duty on the staff of the chief engineer maintenance of way of the Eastern region.

James D. Moffatt, Jr., assistant engineer in the office of the chief engineer of the Central region of the Pennsylvania at Pittsburgh, Pa., has been appointed chief engineer of the Dayton Union, with headquarters at Dayton, Ohio, in which position he will have charge of the elevation of the tracks of that company at Dayton. The Dayton Union, which owns the Union Depot, is controlled by the Pennsylvania, the Baltimore & Ohio and the Cleveland, Cincinnati, Chicago & St. Louis, each of these companies owning one-third of the capital stock.

Collins W. Van Nort, whose promotion to division engineer on the Erie and Ashtabula division of the Pennsylvania, with headquarters at New Castle, Pa., was noted in the December issue, was born April 2, 1891, at Scranton, Pa., and received his higher education at Lehigh University, from which he was graduated in 1913. On June 15, 1913, he entered the service of the Pennsylvania as a rodman, and since that time he has served as transitman, assistant supervisor and supervisor of track. He was holding the last named position at the time of his promotion to division engineer of the Erie and Ashtabula division.

John F. Swenson, whose promotion to division engineer on the Pennsylvania, with headquarters at Tyrone, Pa., was noted in the December issue, was born on July 25, 1888, and received his higher education at Pennsylvania State College, from which he was graduated in 1911. Mr. Swenson entered railway service on October 25, 1911, as a rodman on the Buffalo division of the Pennsylvania, and from July, 1916, until February, 1917, he served as a transitman on the Philadelphia division. He was promoted to assistant supervisor on the Delaware division on February 15, 1917, and later served in the same capacity on the Baltimore and

the Maryland divisions. On December 1, 1922, he was promoted to supervisor on the Renovo division at Erie, Pa., and on January 1, 1927, was transferred to the Philadelphia division, with headquarters at Lancaster, Pa., where he remained until his recent promotion to division engineer.

R. S. Stewart, whose promotion to engineer maintenance of way on the Pennsylvania was noted in the December issue, was born on September 7, 1884, at Mt. Union, Pa., and was educated at the Ohio Northern University. Mr. Stewart entered railway service in July, 1904, as a rodman at Philadelphia, where he was engaged in construction work until September, 1907, when he was promoted to assistant supervisor on the Elmira division, later serving in the same capacity on the Middle and Pittsburgh divisions. He was promoted to supervisor on the Trenton division in December, 1913, and afterwards held the same position on the Allegheny and Philadelphia divisions. He was promoted to division engineer of the Middle division in July, 1922, and later was transferred to the New York division, with headquarters at Jersey City, N. J., where he was located at the time of his recent promotion to engineer maintenance of way.

R. S. Stewart

Samuel Reed Hursh, whose promotion to division engineer on the Atlantic division of the Pennsylvania, with headquarters at Camden, N. J., was noted in the December issue, was born on March 20, 1894, at Mifflinburg, Pa. In June, 1916, he graduated from Pennsylvania State College and later in the same month he entered railway service on the Philadelphia Terminal division of the Pennsylvania as a chainman. In January, 1917, Mr. Hursh was made a rodman on the Tyrone division, and in May of that year he was furloughed for military service as captain and regimental adjutant in the engineer corps of the United States Army. In January, 1919, he returned to the Pennsylvania as assistant supervisor on the Maryland division, and in June of that year he was assigned to special work in the general office at Philadelphia. In March, 1920, Mr. Hursh again became assistant supervisor and served in this capacity on various divisions until October, 1926, when he was promoted to supervisor on the Atlantic division, later being transferred to the Philadelphia division where he remained until his recent promotion to division engineer.

F. M. Graham, whose promotion to assistant engineer of standards of the Pennsylvania was noted in the December issue, was born on January 29, 1872, at Nelson, Ohio, and was educated at the Case School of Applied Science. He entered railway service in 1895, with the Pennsylvania, holding various positions in the engineering department until 1903, when he was promoted to division engineer. In 1918, he was promoted to supervising engineer, with headquarters at Columbus, Ohio, and in 1920, was further promoted to engineer maintenance of way of the Central Ohio division, with headquarters at the same point. In 1924, when the Central Ohio division was abolished, he resumed his former position of division engineer at Columbus, where he remained until September, 1927, when he was promoted to engineer maintenance of way at the Lake division, with headquarters at Cleveland.

F. M. Hawthorne, whose promotion to engineer maintenance of way on the Pennsylvania was announced in the December issue, was born at Wingate, Ind., on October 8, 1883, and was educated at Purdue University. After completing his college course in 1905, he entered railway service with the Pennsylvania at Columbus, Ohio, and from 1909 to 1917, was an engineer on construction. In the latter years, he was promoted to assistant division engineer at Louisville, Ky., and later served in the same capacity at Terre Haute, Ind., Pittsburgh, Pa., and New Castle, until March 1, 1920, when he was promoted to division engineer of the Loganport division, with headquarters at Loganport, Ind. In March, 1921, on account of changes necessitated by the consolidation of certain divisions, Mr. Hawthorne was appointed assistant division engineer, with headquarters at the same point, and on February 1, 1922, he was again promoted to division engineer and assigned to the St. Louis division, with headquarters at Terre Haute, Ind. In August, 1926, he was appointed acting superintendent of the same division, and in January, 1927, he re-entered the engineering department as division engineer of the Cleveland and Pittsburgh division, with headquarters at Cleveland. Mr. Hawthorne was transferred to the Philadelphia Terminal division in June.

Track

H. G. Harmon, extra gang foreman on the St. Louis-San Francisco, has been promoted to roadmaster on the River division, with headquarters at Chaffee, Mo.

B. Rippenhagen, roadmaster on the Gulf, Colorado & Santa Fe, with headquarters at Sealy, Tex., has been transferred to Galveston to succeed **J. T. Curran,** notice of whose death was published in the November issue.

Porter Berryhill, assistant engineer on the Eastern district of the Northern Pacific, has been promoted to roadmaster of the Fargo division, with headquarters at Fargo, N. D., succeeding **Elisha A. Howland,** who has retired.

A. C. Anderson, acting roadmaster on the Creston division of the Chicago, Burlington & Quincy, with headquarters at Red Oak, Iowa, has been promoted to roadmaster, with the same headquarters, to succeed **William Peterson,** deceased.

George Sproule, roadmaster on the Bruce division of the Canadian Pacific, with headquarters at Orangeville, Ont., has been transferred to the Trenton division, with headquarters at Peterboro, Ont., succeeding **A. Frost,** who has been retired on a pension.

N. E. Scribner, track supervisor on the Western district of the Erie at Kent, Ohio, has been promoted to general roadmaster of the Western district, with headquarters at Youngstown, Ohio, succeeding **H. J. Weccheider,** whose promotion to division engineer is noted elsewhere in these columns. **G. L. Dunn,** supervisor at Port Jervis, N. Y., has been transferred to Kent to succeed Mr. Scribner.

The territory of **A.E. Muschott, roadmaster** of the Western district of the Joliet division of the Elgin, Joliet & Eastern, has been extended to include the Eastern district of the same division, which was formerly under the jurisdiction of **D. O'Hern,** notice of whose death was published in the October issue. **J. J. Davis,** assistant engineer, with headquarters at Joliet, Ill., has been promoted to supervisor on the Joliet division, with headquarters at the same point.

J. T. Diffey, supervisor of bridges and buildings on the St. Louis division of the Missouri-Kansas-Texas, with headquarters at Boonville, Mo., has been promoted to roadmaster on the Nevada division. Mr. Diffey was born on December 3, 1889, at Pittsburg, Tex., and entered railway service on June 29, 1906, as a flagman on an extra gang on the M-K-T. On August 20, 1906, he became a laborer in the bridge and building department and was promoted successively to bridge carpenter, assistant pile-driver foreman and pile-driver foreman. In August, 1928, he was promoted to supervisor of bridges and buildings, which position he was holding at the time of his recent promotion to roadmaster.

Conrad Firman Trowbridge, whose promotion to supervisor on the Baltimore division of the Pennsylvania with headquarters at York, Pa., was noted in the December issue, was born April 30, 1902, at Lynn, Mass. Mr. Trowbridge graduated from Princeton University in 1924 and took a post gradu-

ate course in architecture. He entered railway service as a rodman on the Pittsburgh division of the Pennsylvania, on June 19, 1925, at Johnstown, Pa., and on September 16, 1926, he became engineer in charge of special construction work at Conemaugh, Pa. On July 1, 1927, he was made an assistant supervisor on the Conemaugh division, with headquarters at Blairsville, Pa., and on January 1, 1928, he was transferred to the New York division, with headquarters at Trenton, N. J., where he remained until his recent promotion to supervisor.

A. Peterson has been appointed acting roadmaster on the Cochrane division of the Canadion National, with headquarters at Hearst, Ont., succeeding **A. Malo**, who has been promoted to roadmaster on the same division, with headquarters at Taschereau, Que., where he succeeds **W. Fitzgibbons**, retired. **Octave Robin** has been appointed assistant roadmaster on the Cochrane division, with headquarters at Taschereau, succeeding **J. Baker**, who has resumed his former duties in the construction department.

Geo. M. Brum, whose promotion to roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Enid, Okla., was noted in the November issue, was born on March 22, 1895, at Iowa City, Ia., and graduated from the State University of Iowa in 1919. Mr. Brum entered railway service as a chainman and rodman on the Rock Island during his college vacation in 1917 and was similarly employed during his vacation in 1918. After his graduation in June, 1919, he again entered the service of the Rock Island, serving as a rodman and later as a transitman until April 1, 1923, when he was promoted to building inspector, in the chief engineer's office. He was promoted to general foreman at Seminole, Okla., on April 1, 1927, and was further promoted to roadmaster, with headquarters at Shawnee, Okla., on September 12 of the same year. Mr. Brum was appointed building inspector on June 1, 1928, which position he was holding at the time of his promotion.

Changes on the Pennsylvania

T. F. Angus, assistant on engineer corps of the Pittsburgh division of the Pennsylvania, has been promoted to assistant supervisor on the Renovo division, succeeding **C. F. Montague**, who has been transferred to the Eastern division, at Canton, Ohio, where he replaces **G. A. Sawyer**, who has been promoted to supervisor on the Erie and Ashtabula division with headquarters at Jamestown, Pa., to succeed **S. C. Hofmeister**. **C. R. Montgomery**, assistant on engineer corps on the Conemaugh division, has been promoted to assistant supervisor on the Allegheny division at Oil City, Pa., succeeding **D. M. Clarke**, who has been transferred to the Pittsburgh division at Johnstown, Pa., where he takes the place of **G. W. Sauvain**, who has been promoted to supervisor on the Cleveland division at Wellsville, Ohio, to succeed **C. P. Willis**, whose transfer to the Pittsburgh division at Johnstown was noted in the November issue. **I. S. Brumagim**, assistant on engineer corps, has been promoted to assistant supervisor on the Pittsburgh division at Pittsburgh, to succeed **E. R. Schultz**, who has been transferred to the Eastern division at Alliance, Ohio, to succeed **C. B. Buffington**, deceased. **F. E. Flynn**, assistant on engineer corps, has been promoted to assistant supervisor on the Buffalo division at Buffalo, N. Y., to succeed **C. J. Kooser**, who has been promoted to supervisor on the Pittsburgh division at Trafford, Pa., to take the place of **L. B. Woods**, who has been transferred to Pittsburgh on the same division to succeed **F. G. Church**, who, in turn, has been transferred to the Eastern division at Wooster, Ohio, to replace **C. G. Grove**, whose promotion to division engineer is mentioned elsewhere in this issue. **D. A. Sipe** has been appointed assistant supervisor on the Pittsburgh division at East Liberty, Pa., succeeding **J. C. Groft**, promoted to supervisor on the Wheeling division at Steubenville, Ohio, to suceed **C. P. Sipe**, who, in turn, has been transferred to the Eastern division, at Canton, Ohio, where he succeeds **J. F. McKenna**, who has been promoted to inspector of maintenance of way on the same division. **T. J. Murray**, assistant on engineer corps, has been promoted to assistant supervisor on the St. Louis division to succeed **E. R. Burchette**, whose promotion to supervisor was noted in the November issue.

R. W. Sheffer, whose promotion to supervisor of track on the Pennsylvania with headquarters at Wilkes-Barre, Pa., was noted in the December issue, was born on August 9, 1902, at York, Pa. Mr. Sheffer was educated at Bucknell University and entered railway service on August 2, 1923, as a rodman on the Sunbury division of the Pennsylvania. On November 15, 1926, he was promoted to assistant supervisor, with headquarters at Clayton, Del., and until the time of his recent promotion to supervisor, Mr. Sheffer has been an assistant supervisor at Jersey City, N. J., Huntingdon, Pa., West Philadelphia, and Wilkes-Barre.

Frank P. Filippelli, whose promotion to supervisor of track on the Pennsylvania, with headquarters at Jamesburg, N. J., was noted in the December issue, was born March 17, 1893, at Harrisburg, Pa. Mr. Filippelli graduated from Pennsylvania State College in 1915, and entered railway service in May, 1917, as a draftsman on the Pennsylvania, at Harrisburg, Pa. Later in the same year he was made a rodman on the Philadelphia division at Harrisburg, and in June, 1918, he was promoted to assistant supervisor with headquarters at Titusville, Pa. From July, 1920, until the time of his promotion to supervisor, Mr. Filippelli was an assistant supervisor at Columbia, Pa., Bordentown, N. J., and Baltimore, Md.

Bridge and Building

L. A. Warren has been appointed bridge and building supervisor on the Shasta division of the Southern Pacific, with headquarters at Dunsmuir, Cal., to succeed **J. G. Wiley**, who has retired.

Purchasing and Stores

Charles R. Peddle, assistant purchasing agent of the Pennsylvania, with headquarters at St. Louis, Mo., retired on January 1 under the pension rules after 52 years' service with that road.

E. J. Clark, general foreman in the stores department of the Chicago, Burlington & Quncy at Havelock, Neb., has been promoted to storekeeper at Creston, Iowa, succeeding **F. M. Phebus**, who has been assigned to other duties.

C. A. Rice has been appointed storekeeper on the Chesapeake & Ohio, at Caney Fork, W. Va., succeeding **C. S. Wetherholt**, who has been transferred to Thurmond, W. Va. **L. C. Clinkinbeard** has been appointed storekeeper at Boston, Ind., to succeed **R. M. Taylor**, who has been transferred to Shelby, Ky.

Obituary

Job Tuthill, assistant chief engineer of the Pere Marquette, with headquarters at Detroit, Mich., and at one time engineer of buildings of the Kansas City Terminal, died on December 28.

Edward T. Stone, purchasing agent of the Minneapolis, St. Paul & Sault Ste. Marie and the Duluth, South Shore & Atlantic, with headquarters at Minneapolis, Minn., died in that city on December 22 after a short illness.

William Peterson, roadmaster on the Creston division of the Chicago, Burlington & Quincy, with headquarters at Red Oak, Iowa, who had been granted a furlough on November 15 on account of ill-health, died on December 9.

L. T. Cox, supervisor on the Louisville & Nashville, with headquarters at Columbia, Tenn., died on December 7 at his home in Columbia, after a short illness, at the age of 74 years. Mr. Cox had been in the employ of the L.&N for almost 51 years.

Edward J. Pearson, whose resignation as president of the New York, New Haven & Hartford was noted in the December issue, together with a reproduction of his photograph and a sketch of his career, died on December 7, at the Johns Hopkins Hospital, Baltimore, Md., as the result of a cerebral hemorrhage.

William L. Tarbet, land and tax commissioner of the Illinois Central, with headquarters at Chicago, and an engineer by training and experience, died at him home in Flossmoor, Ill., on December 28. Mr. Tarbet had been in the service of the Illinois Central for 35 years and expected to retire on reaching the age of 70 on January 21.

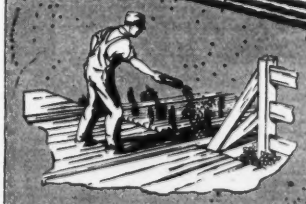
Announcing

The ATLACIDE NON-POISONOUS DUSTER

Improved Atlas "N P" Weed Killer in Dust Form

The Atlacide Duster is ideal for use around Station Grounds

For killing weeds around Tie Yards



For Cattle Guards

A Weed Killing Instrument that every Section Foreman Should Have

No Water—No Mixing—No Spraying

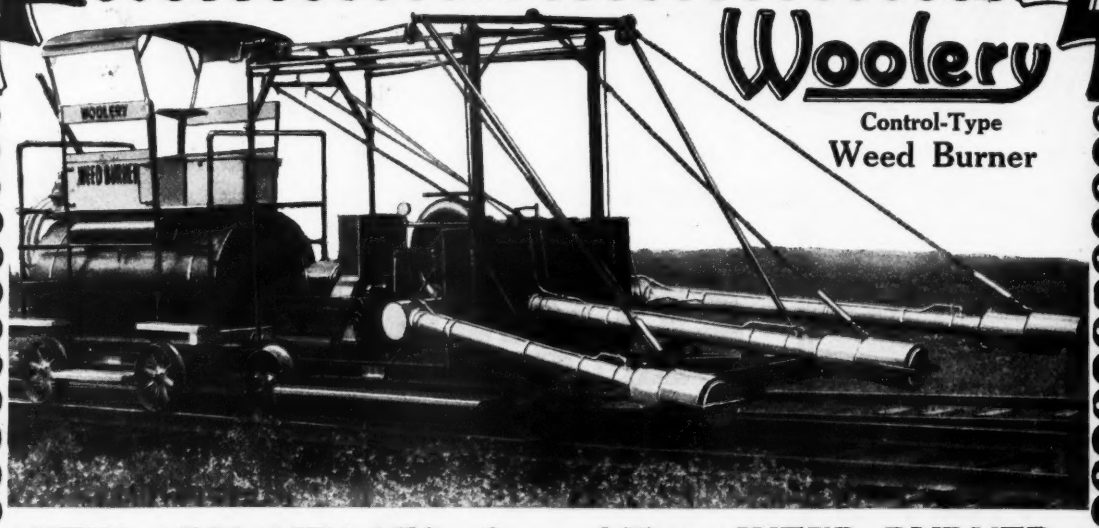
Write for Prices

Keep Switch Stands free of weeds with the Atlacide Duster

Weeds along the ballast edge are easily controlled with the Duster

Chipman Chemical Engineering Co. Inc.

BOUND BROOK, N. J.



Woolery

Control-Type Weed Burner

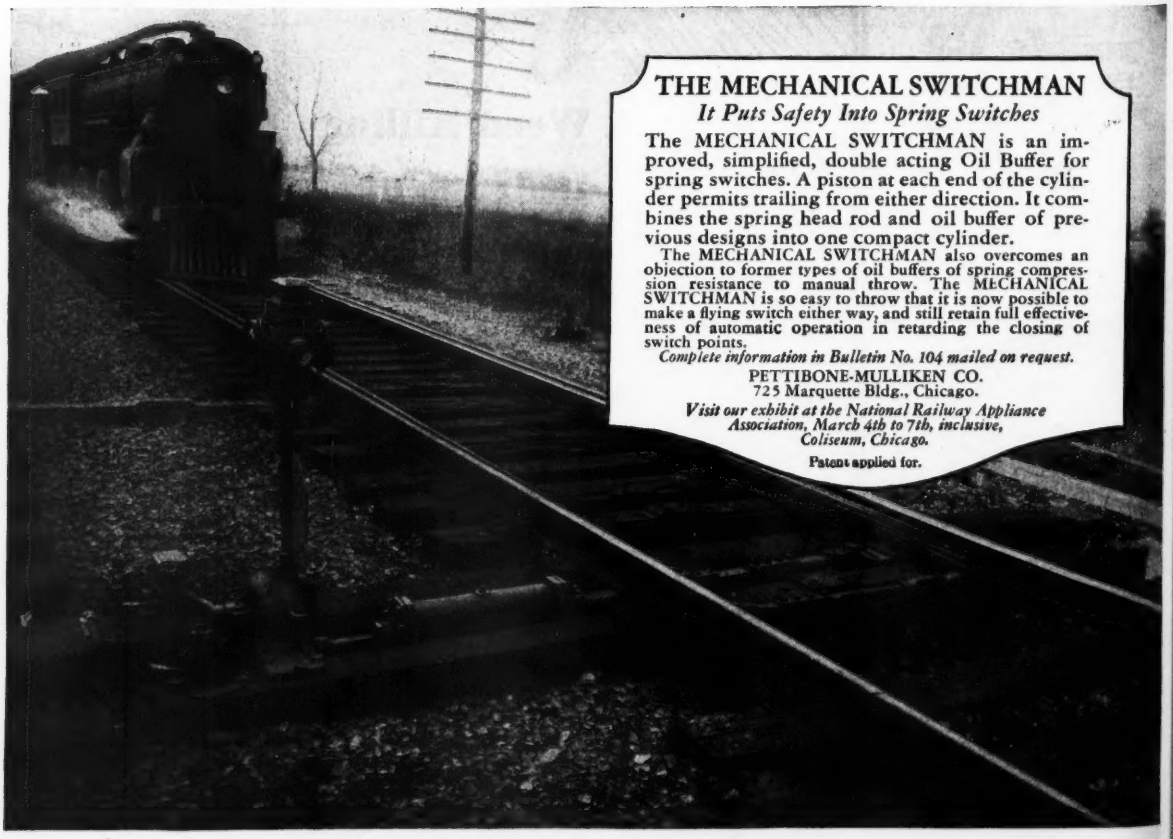
NEW ADVANTAGES—Control-Type WEED BURNER

Years of experience, operation and study have perfected the 1929 Woolery Weed Burners. They offer railroads a definite solution of the weed problem, with several new advantages which were thoroughly proved last season—

1. Burning weeds on ballast and in ditches.
2. Costs but a fraction of any other method.
3. Extra-sturdy and durable construction; new patented tube-burners that practically eliminate maintenance expense.

Write for complete information—data on weed destroying

WOOLERY MACHINE CO., 2913 Como Ave. S. E., Minneapolis, Minn.



THE MECHANICAL SWITCHMAN

It Puts Safety Into Spring Switches

The MECHANICAL SWITCHMAN is an improved, simplified, double acting Oil Buffer for spring switches. A piston at each end of the cylinder permits trailing from either direction. It combines the spring head rod and oil buffer of previous designs into one compact cylinder.

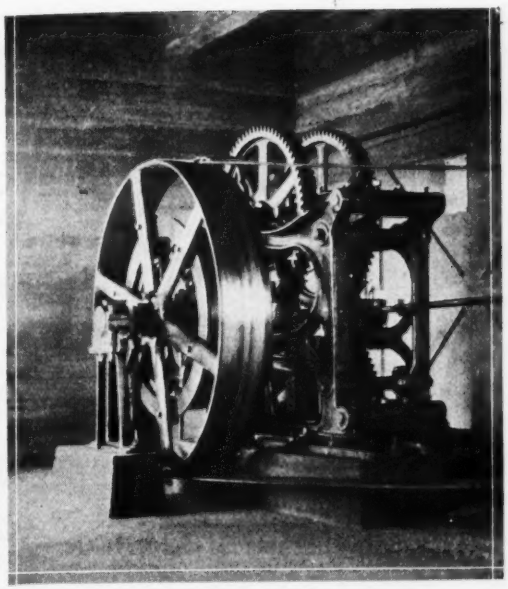
The MECHANICAL SWITCHMAN also overcomes an objection to former types of oil buffers of spring compression resistance to manual throw. The MECHANICAL SWITCHMAN is so easy to throw that it is now possible to make a flying switch either way, and still retain full effectiveness of automatic operation in retarding the closing of switch points.

Complete information in Bulletin No. 104 mailed on request.

PETTIBONE-MULLIKEN CO.
725 Marquette Bldg., Chicago.

Visit our exhibit at the National Railway Appliance Association, March 4th to 7th, inclusive, Coliseum, Chicago.

Patent applied for.



Belt driven Pomona supplying water to the Santa Fe at Cutter, New Mexico

THE
SANTA FE
Finds the
"POMONA"
DEEP WELL DOUBLE STROKE POWER PUMP
VERY ECONOMICAL— and EFFICIENT!

THE over-lapping stroke of the Pomona, its slow speed and reciprocating action—its ruggedness and simplicity of design—all combine to insure maximum uninterrupted service year after year at a remarkably low operating and maintenance cost. This, plus its unusually high efficiency, has influenced the purchase of Pomona pumps by many large railroads — the Santa Fe being only one.

Why not let us tell you what the Pomona will do for you? Write today.

UNITED IRON WORKS, INC.
Springfield, Missouri

GENERAL OFFICES:
KANSAS CITY, MO.

"UNITED" IRON WORKS INC. FOR SERVICE

Depend on DURABLES MECHANICAL

Winter installation is no problem

Every railroad man who has bumping posts to install will find he has eliminated half his work and shortened the time on the job the moment he starts installing the new

Improved DURABLE Bumping Posts

In making it possible to install the DURABLE without moving a shovelful of dirt, and with only a few holes to drill in the field, not one particle of its strength is sacrificed.

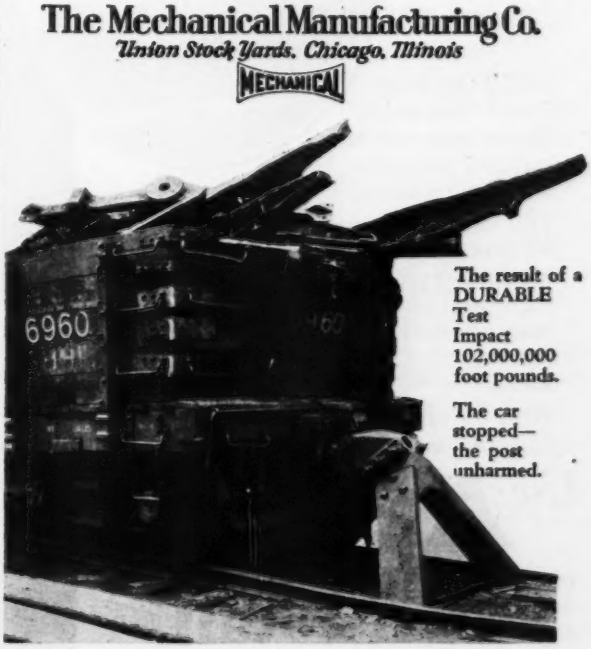
Every Durable that has ever been built, or ever will be, has been designed and built to stop all cars—including the latest heavy-duty type. The first and last duty of the DURABLE is to protect property and people from runaway cars—railroads from property losses and damage suits. The convenience in installation is velvet—an additional Durable attraction. Try a Durable on your next installation, test it as we did—see below.

Send for dimension and specification sheets.

Manufactured by

The Mechanical Manufacturing Co.
Union Stock Yards, Chicago, Illinois

MECHANICAL

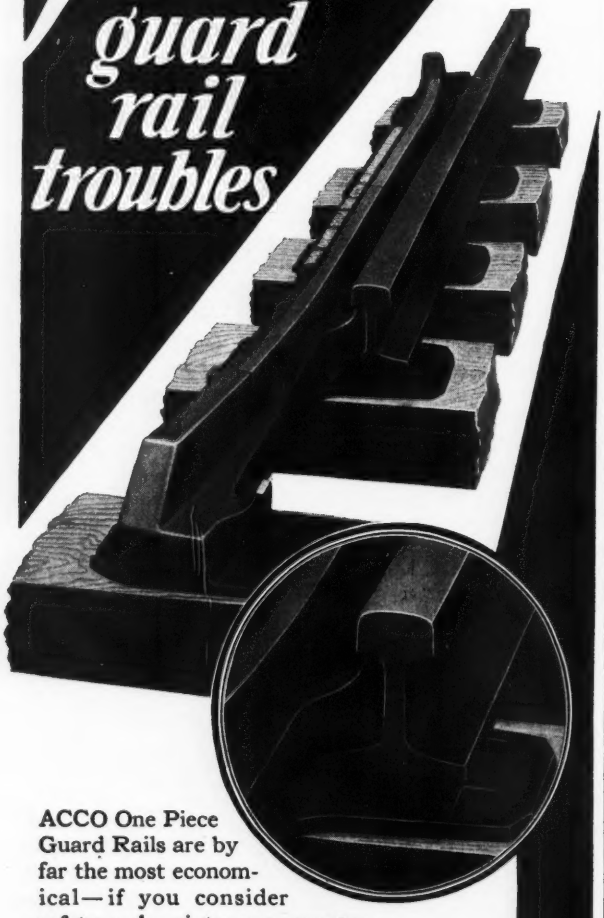


The result of a DURABLE Test Impact 102,000,000 foot pounds.

The car stopped—the post unharmed.

The DURABLE slogan has always been—always will be—
DURABLES stop all comers.

forget guard rail troubles



ACCO One Piece Guard Rails are by far the most economical—if you consider safety and maintenance expense.

The lug construction, distinctive with ACCO Guard Rails, provides a flangeway absolutely fixed and positive. Wear resisting manganese inserts are quickly replaced when necessary. These and other important features of the ACCO One Piece Guard Rail are worth full consideration.

Write for full information, giving us the rail section and tie spacing.

Use **ACCO** *one piece* **Guard Rail**

AMERICAN CHAIN COMPANY, *Inc.*
BRIDGEPORT, CONNECTICUT

Largest Manufacturer of Welded and Weldless Chain for Every Railroad Purpose

POLES TIES TIMBER

Lower Maintenance—
Less Service Interruption
—Greater Efficiency—

Railroad ties, timber and poles if properly treated with Zinc Meta Arsenite will give uninterrupted—day in and day out—service for many years after an untreated piece would require replacement.

In addition to its high toxicity to white ants and fungi, ZMA is non-leaching and non-conductive. ZMA does not affect the wood strength. This means permanently protected wood that will not break down and develop checks from tie plates or spikes, and leave the heartwood to attack by fungi or white ants.

Before placing your next order for railroad timber, investigate the dollars-and-cents advantages which ZMA can bring you. Write for details today.

CURTIN-HOWE CORPORATION
TIMBER PRESERVATION ENGINEERS
11 PARK PLACE
NEW YORK CITY

Crozer Bldg.
Philadelphia, Pa.

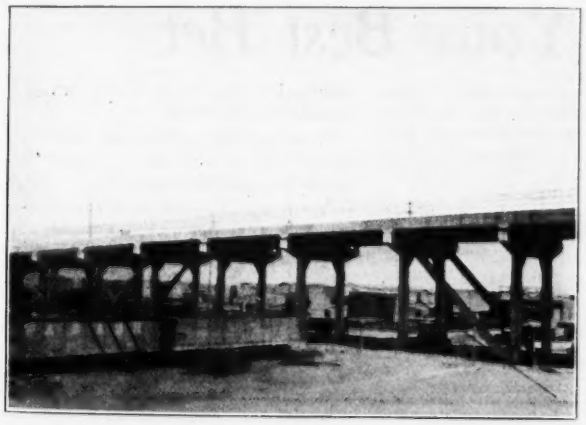
New Orleans Bank Bldg.
New Orleans, La.

Unloads Quickly in Ditcher Service

MAGOR Automatic Air Dump Cars perform excellently in ditcher service. Unloading is instantaneous and complete. These are necessary features when working between train times on main lines. Quick "get-aways" so vitally important in preventing traffic delays are obtained because these cars dump quickly to either side without time killing adjustments. They attain a 50° angle in full dumped position thereby assuring complete discharge of all loads clear of track ballast leaving a clear track for safe transportation.

Magor Car Corporation
50 Church St., New York

MAGOR *Automatic Air Dump* CARS



Another Service

Steel expansion rollers for viaducts are protected perfectly with NO-OX-ID. It does not flow in hot weather nor harden, crack or allow rusting beneath the protective coating.

NO-OX-ID
IRON-RUST
TRADE MARK
The Original Rust Preventive

Add this to the many maintenance services NO-OX-ID can perform for you. Or if you are not yet familiar with NO-OX-ID, realize that 100 railroads are using it and let us tell you where it can be of immediate unequalled service to you.

DEARBORN CHEMICAL COMPANY

310 S. Michigan Ave.
Chicago

299 Broadway
New York

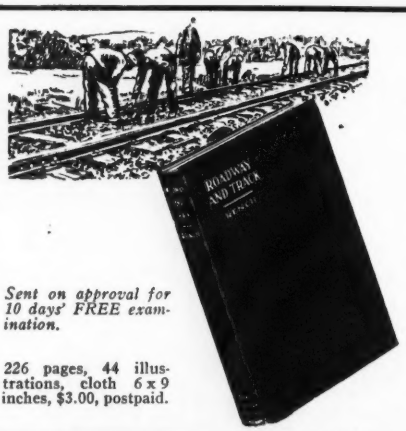
Canadian Factory and Offices: 2454-2464 Dundas St., W. Toronto

As Effective in Winter as in Summer

MEXICAN Graphite Curve Grease is not affected by rain, snow or other adverse weather conditions. Rain or shine, it adheres to the rail and carries a long distance beyond the automatic curve lubricator. It saves rails and reduces flange wear as effectively in winter as in summer.

The United States Graphite Company
Saginaw, Michigan

Mexican Graphite Curve Grease USG
SAVES RAILS – REDUCES FLANGE WEAR



Sent on approval for 10 days' FREE examination.

226 pages, 44 illustrations, cloth 6 x 9 inches, $3.00, postpaid.

Your Best Bet

The thinking man never disregards the practical value of reading such books as "Roadway and Track." This book covers in a sentence facts that theorizing would stretch to a page.

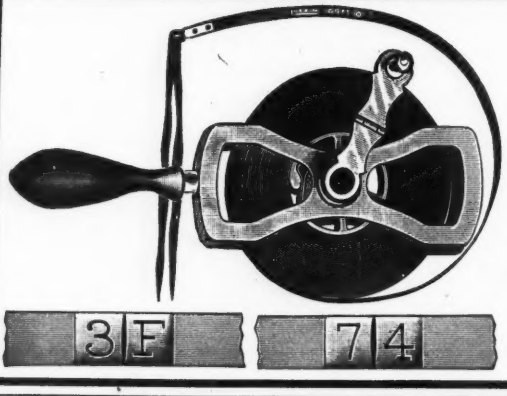
This condensation has permitted the author to do what few have done previously—make the least demand upon the readers' time in giving him the meat of modern maintenance practice.

Your best bet is "Roadway and Track" if you want facts you can apply to your own work.

You may keep this book for 10 days' examination without cost.

Send for a copy today.

Simmons-Boardman Publishing Co.
"The House of Transportation"
30 Church Street New York, N. Y.



LUFKIN

"MICHIGAN" CHAIN TAPES

A sturdy Chain, 5/16" wide. Built for hard use, and most popular for rough survey. Half-gage mark when requested. Furnished measuring from end of chain, or with blank space, as specified.

Etched Chain and Engineers Tapes

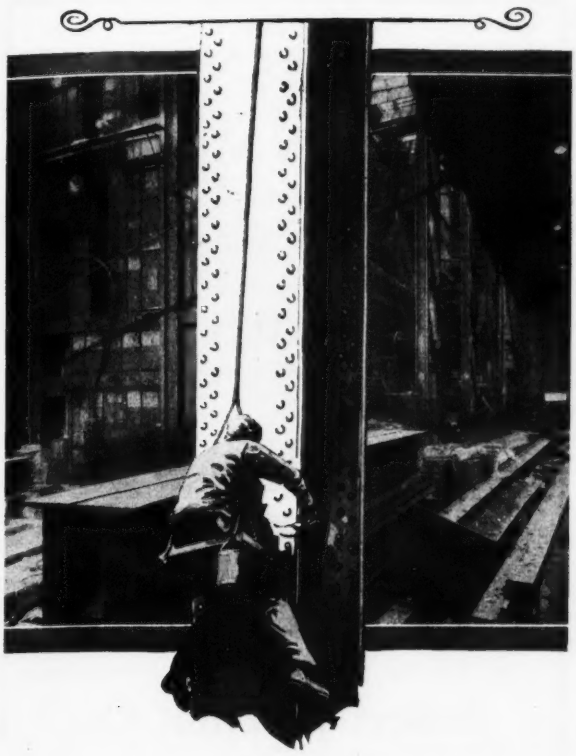
Woven Tapes of All Descriptions

Send for Catalog

New York
Windsor, Canada

THE LUFKIN RULE CO.

SAGINAW, MICH.



A splendid example of central station design, and equally important as an example of modern steel protection practice is the Commonwealth Edison Company's Chicago Plant. All of the steel framework of this structure was painted with Dixon's Silica-Graphite Paint. By this far-sighted procedure incalculable years of usefulness were added to the skeleton and supporting members of this imposing structure.

Tons of steel are in this building and hundreds of gallons of Dixon's Silica-Graphite Paint were used to assure to this steel framework that "ounce of prevention" against the ravages of rust and corrosion. Engineers, architects, contractors and the Commonwealth Edison Company's officials are unanimous in approving the methods employed to safeguard and lengthen the life of this structure.

Case after case can be cited of bridges, gas holders, tanks, industrial structural work, train sheds and the like which have been protected from rust, corrosion and process deteriorating, incident to extremes of temperature, climate, vibration, gas acid, cinder, and dirt conditions, for from 6 to 20 years by a properly applied coating of Dixon's Silica-Graphite Paint.

Get the full story of Dixon's Silica Graphite Paint by sending for Booklet No. B-187 today!

Joseph Dixon Crucible Company

Jersey City D X N New Jersey

Established 1827

DIXON'S SILICA GRAPHITE PAINT

Adequate Protection at Minimum Ultimate Cost

Genasco products are noted for long wear

The leading railway systems use Genasco Asphaltic Protective Products so extensively because experience has proved their unusual durability. Look over this list of Genasco products and let us send you complete information regarding any or all of them.

Genasco Ready Roofings (Smooth and Slate Surface)
Genasco Sealbac Shingles (Individual and Strip)
Genasco Latite Shingles
Genasco Standard Trinidad Built-up Roofing
Genasco Membrane Waterproofing
Genasco Waterproofing Asphalts
Genasco Waterproofing Felts
Genasco Waterproofing Fabric
Genasco Asphalt Pipe Coating
Genasco Asphalt Mastic
Genasco Asphalt Fibre Coating
Genasco Roof Coating
Genasco Industrial Paint
Genasco Concrete Primer
Genasco Elastic Boiler Cement
Genasco Trinidad Lake Roofing Asphalts
Genasco Battery Seal Asphalt
Genasco Battery Paint
Genasco Asphalt Putty
Genasco Acid-proof Paint
Genasco Asphalt Saturated Felt
Genasco Deadening Felt
Genasco Insulating Paper
Genasco Red Sheathing Paper
Genasco Stringed Felt
Genasco Wall Lining
Curcrete, an asphalt emulsion for curing concrete
Barber Brand Cold Repair Cement (for crossings more permanent than wooden planks and for platform construction)
Genasco Acid-Proof Mastic
Genasco Insulating Asphalt (for use in Box Car Construction)
Genasco C R C Damp-Proofing for use on abutments, walls, cellars, etc.

THE BARBER ASPHALT COMPANY

1600 Arch Street, Philadelphia

New York Chicago Pittsburgh St. Louis Kansas City San Francisco

LANDMARKS-

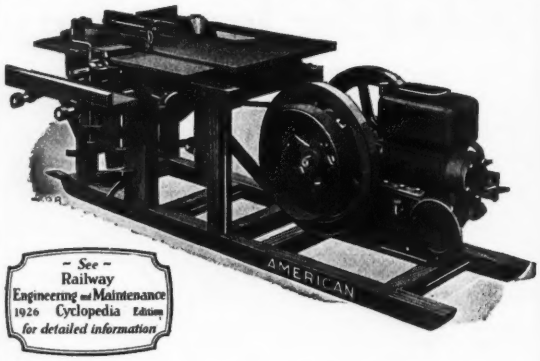
A HUNDRED YEARS FROM NOW.
SPI-COR CAST IRON CULVERTS
AND THE BIG TREE AT
THATE'S.

AMERICAN CASTING CO.
DRAWER 591
BIRMINGHAM, ALA.

Please send us Booklet "SPI-COR, A New Era In Culverting," giving information about spiral corrugated cast iron pipe for permanent, economical culverts.

Name.....
Title.....
City and State.....

COST CUTTERS



— See —
Railway Engineering and Maintenance 1926 Cyclopedia Edition
for detailed information

Portable Woodworking Machinery for use on the job.

Saw Mills, Woodworkers, Planers, Jointers, Band Saws, Re-saws, Cut-off Saws.

Ask for Complete Catalog

American Saw Mill Machinery Co.
164 Main Street Hackettstown, N. J.

MORE THAN HALF
of the
RAILROAD MILEAGE
of the
UNITED STATES
is being laid with
RAILS
made under
HUNT
Special H Inspection

Robert W. Hunt Co.
Engineers
2200 Insurance Exchange, Chicago

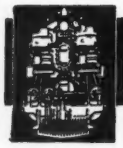
Curve and Switch Work
MADE EASY FOR YOU

How often have you stood there and pondered just how to go ahead with that curve problem? How often have you forgotten a rule for computing a switch dimension? Suppose just at that moment you put your hand to your side pocket and found in it a book (pocket-size) that answered every possible question *that can come up* in curve and switch work? That is the kind of book we are now asking you to examine. A book written by an expert—a man who discusses his subject in the light of 25 years' actual experience in maintenance work on a large eastern road. He knows from practical experience what you want, what information you need daily. All the information is in "Simplified Curve and Switch Work" and written in plain, everyday understandable English and in a simple, practical manner.

Short methods that save time by formula, by explanation and by illustration

See SIMPLIFIED CURVE AND SWITCH WORK

By W. F. RENCH, formerly Supervisor on Pennsylvania Railroad



SIMMONS-BOARDMAN
FREE EXAMINATION COUPON

Simmons-Boardman Publishing Company,
Book Department, 30 Church Street, New York, N. Y.

Please send me postpaid for ten days' free examination a copy of Simplified Curve and Switch Work. I will either return the book or remit $2.00.

NAME.....

ADDRESS.....

CITY..... STATE.....

POSITION..... COMPANY.....

MT-1-29

Read over this table of contents.

1. The Relining of Curves with a String.
2. Preliminary Study of the Curve.
3. The Solution of String Lining Problems.
4. Superelevation of Curves.
5. The Spiral.
6. The Vertical Curve.
7. Economics of Curves.
8. Essential Elements in the Design of Switch Connections.
9. Rules for Computing Switch Dimensions.
10. Rules for Various Functions of Turnouts.
11. Practical Considerations in Installing Turnouts.
12. Methods in Installing and Maintaining Switches.
13. Simplified Field Work.
14. Special Practice.

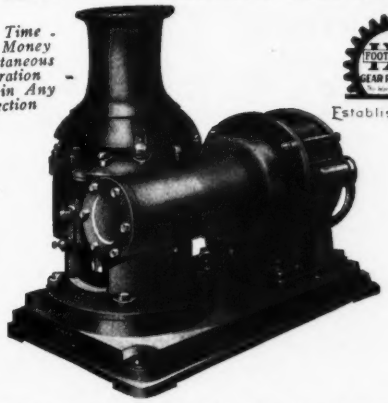
FOR 10 DAYS' FREE EXAMINATION
Just Clip and Mail This Coupon

IXL
"HYGRADE" CAR SPOTTER
Made in Two Sizes—No. 6 and No. 8

Saves Time - Saves Money Instantaneous Operation - Pulls in Any Direction

FOOTE BROS. IXL GEAR PRODUCTS

Established 1859

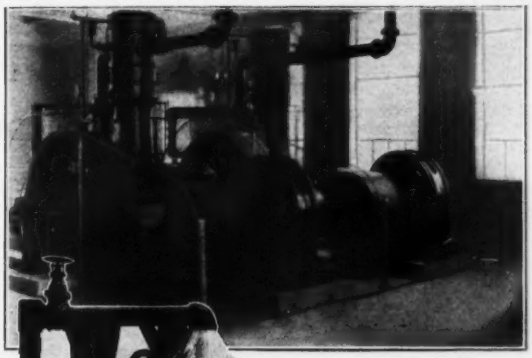


The IXL "HYGRADE" Car Spotter is a compact, powerful, fully enclosed, self-lubricating unit, consisting of a motor, a "HYGRADE" Vertical Worm Reducer and a capstan.

Reliability, quietness of operation, unusual wearing qualities, and long life under severe operating conditions, are features of this IXL Car Spotter.

Send for Catalog No. 500

FOOTE BROS. GEAR & MACHINE CO.
225 N. Curtis St., CHICAGO, Ill.



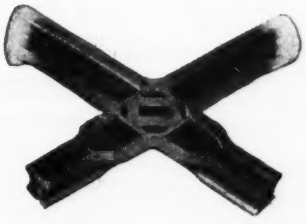
"No Permanent Well Water Available," they thought—

—But Sullivan Air Lift Air Made Wells Gave Amarillo 7 Million Gallons Daily

Amarillo, Texas, needed more water. A 25-foot bed of fine quicksand, saturated with water offered the only source of supply. It lay 145 feet from the surface.
But wells previously drilled in the canyon had failed. Sand clogged the screens. The wells fell off to less than 90 g.p.m. Where the sand was pumped out—the overlying clay caved into the wells.
Nobody thought the sand strata of Palo Dure Canyon could yield a permanent water supply. But a 20-in. "Air Made" Well, pumped by Sullivan Air Lift was installed. It started at 60 g.p.m. In three weeks it was producing 700 g.p.m.
The "Air Made" Well process removed the sand and inserted coarse gravel. Nine more "Air Made" Wells were installed. Their daily capacity is seven million gallons.
Sullivan Air Lift has solved many water problems. If your wells slow up—if you are interested in a water system that has no moving parts in the well to need inspection or repair—investigate modern Sullivan Air Lift.

Send for booklets

SULLIVAN MACHINERY COMPANY
411 Peoples Gas Bldg., Chicago



New Scientifically Designed Crossing

Patented July 6, 1926

It is the exceptional wear-resisting quality of Tisco Manganese Steel that makes Wharton Trackwork so economical.

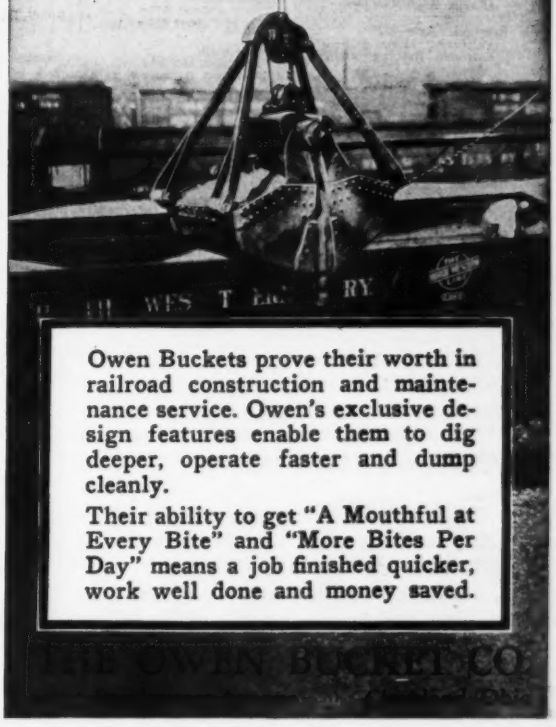
SWITCHES - FROGS CROSSINGS

It is worthy of note that Manganese Steel in Trackwork was introduced by Wharton in 1894 and that it still leads the field for this purpose.

Bridge Rails **One Piece Guard Rails**

Wm. Wharton Jr. & Co., Inc.
EASTON, PA.

Owen Buckets



Owen Buckets prove their worth in railroad construction and maintenance service. Owen's exclusive design features enable them to dig deeper, operate faster and dump cleanly.

Their ability to get "A Mouthful at Every Bite" and "More Bites Per Day" means a job finished quicker, work well done and money saved.

THE OWEN BUCKET CO.

Buyers' Guide

CLASSIFIED INDEX TO ADVERTISERS

Acetylene Dissolved
Oxweld Railroad Service Company

Air Compressors
Chicago Pneumatic Tool Co.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Hoists
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Air Lift Pumping Machinery
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Airport Drainage
Armco Culvert Mfrs. Assn.

Anchors, Rail
See Rail Anchors

Anti-Creepers, Rail
Bethlehem Steel Co.
Lundie Engineering Co.
P. & M. Co.
Verona Tool Works
Woodings Forge & Tool Co.

Asphalt
Barber Asphalt Co.
Kentucky Rock Asphalt Co.

Ballast Cleaners
Industrial Brownhoist Corp.
Railway Maintenance Corp.

Ballast Spreaders
Jordan Co., O. F.

Bank Builders
Jordan Co., O. F.

Bank Slopers
Jordan Co., O. F.

Ballast Trimmers
Jordan Co., O. F.

Band Saws
American Saw Mill Machinery Co.

Bars
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Bearings, Axle
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Bearings, Roller
Timken Roller Bearing Co.

Bearings, Tapered Roller: Thrust and Journal Box
Timken Roller Bearing Co.

Benders, Rail
See Rail Benders

Blowers, Turbo
Ingersoll-Rand Co.

Bolts
Bethlehem Steel Co.
Illinois Steel Co.

Bonding Outfits, Rail
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Braces, Track
Ramapo Ajax Corp.

Bridge Floors
Armco Culvert Mfrs. Assn.

Buckets
Industrial Brownhoist Corp.
Owen Bucket Co.

Buckets, Clam Shell
Industrial Brownhoist Corp.
Owen Bucket Co.

Building Beams, Concrete
Federal Cement Tile Co.

Building Papers
Barber Asphalt Co.

Bumping Posts
Mechanical Mfg. Co.

Calcium Carbide
Oxweld Railroad Service Co.

Car Replacers
American Chain Co., Inc.

Cars, Ballast
See Ballast Cars

Cars, Dump
See Dump Cars

Cars, Hand
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalmazoo Ry. Supply Co.
Northwestern Motor Co.

Cars, Industrial
Magor Car Corp.

Cars, Inspection
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Motor
Fairbanks, Morse & Co.
Fairmont Ry. Motors, Inc.
Kalamazoo Ry. Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Cars, Section
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Car, Spreader
Jordan Co., O. F.

Cars, Velocipede
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.

Castings
Bethlehem Steel Co.
Timken Roller Bearing Co.
Wharton, Jr. & Co., Inc., Wm.

Catchbasins
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Cattle Guards
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.

Cement
Ash Grove Lime & Portland Cement Co.

Cement Repair
Barber Asphalt Co.

Cement Roofing Tile
Federal Cement Tile Co.

Chemical Weed Killer
Chipman Chemical Engineering Co., Inc.

Clamshell Buckets
See Buckets, Clamshell

Clips, Adjustable
Ramapo Ajax Corp.

Coal Handling Machinery
Industrial Brownhoist Corp.
Northwest Engineering Co.

Coaling Stations
Fairbanks, Morse & Co.

Compressors
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Compromise Joints
See Joints, Compromise

Concrete Roofing Tile
Federal Cement Tile Co.

Concrete Units, Miscellaneous
Federal Cement Tile Co.

Condensers
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Corrosion Preventive
Dearborn Chemical Co.

Corrugated Iron
Armco Culvert Mfrs. Assn.

Cranes, Barge, Electric Erecting, Gantry, Locomotive Pillar, Transfer, Tunnel, Wharf and Wrecking
American Hoist & Derrick Co.
Buckeye Traction Ditcher Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Northwest Engineering Co.

Creosoted Timber
See Timber, Creosoted

Cribbing, Concrete
Federal Cement Tile Co.

Crossing Gates
Foote Bros. Gear & Machine Co.
Kalamazoo Railway Supply Co.

Crossings, Highway
Barber Asphalt Co.
Kentucky Rock Asphalt Co.

Crossings, Rail
Bethlehem Steel Co.
Pettibone-Mulliean Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Culvert Pipe
American Casting Co.
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.
U. S. Cast Iron Pipe & Fdry. Co.

Culverts, Corrugated Metal
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Culverts, Paved Invert
Armco Culvert Mfrs. Assn.

Cypress, Red
Southern Cypress Mfrs. Assn.

Derails
Q. & C. Co.
Wharton Jr. & Co., Wm.

Derailing Switches
Ramapo Ajax Corp.

Diesel Engines
Chicago Pneumatic Tool Co.
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Diesel Electric Power Plants
Fairbanks, Morse & Co.
Ingersoll-Rand Co.

Discing Machines
Fairmont Railway Motors, Inc.

Disinfectants
Chipman Chemical Engineering Co., Inc.

Ditchers
American Hoist & Derrick Co.
Buckeye Traction Ditcher Co.
Harnischfeger Corp.
Jordan Co., O. F.
Northwest Engineering Co.

Doors
Richards-Wilcox Mfg. Co.

Draglines
Northwest Engineering Co.

Drainage Gates
Armco Culvert Mfrs. Assn.

Drains, Perforated
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Drills, Pneumatic
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Drills, Rock
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Verona Tool Works

Drill Steel, Rock
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Drills, Track
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Kalamazoo Railway Supply Co.

Dump Cars
Jordan Co., O. F.
Magor Car Corp.

Electric Cranes (Locomotive, Pillar, Transfer & Wrecking)
See Cranes

Electric Light and Power Plants
Fairbanks, Morse & Co.

Electric Power Units
Electric Tamper & Equipment Co.
Northwestern Motor Co.
Syntron Co.

Electric Snow Melters
Lundie Engineering Corp.
Q. & C. Co.

Engines, Gasoline
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Motor Car
Fairbanks, Morse & Co.
Fairmont Railway Motor Co.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Engines, Oil
Chicago Pneumatic Tool Co.
Fairbanks, Morse Co.
Fairmont Railway Motors, Inc.
Ingersoll-Rand Co.

Excavators
American Hoist & Derrick Co.
Harnischfeger Corp.
Northwest Engineering Co.

Fences
Cyclone Fence Co.
Q. & C. Co.

Fence, Fabric
Cyclone Fence Co.

Fence Posts
Q. & C. Co.

Fibre Angle Pieces, Bushings, Etc.
Q. & C. Co.

Fibre Insulations
Q. & C. Co.

Flangers, Snow
Q. & C. Co.

Flangeway Guard
Bethlehem Steel Co.

Float Valves
Fairbanks, Morse & Co.

Floor Coverings
Barber Asphalt Co.

Forgings
Bethlehem Steel Co.

Frogs
Bethlehem Steel Co.
Pettibone-Mulliken Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Inc., Wm.

Gages, Measuring
Lufkin Rule Co.

Gages, Pressure Gas
Oxweld Railroad Service Co.

Gas, Acetylene
Oxweld Railroad Service Co.

Gates, Drainage
Armco Culvert Mfrs. Assn.
Toncan Culvert Mfrs. Assn.

Grading Machinery
American Hoist & Derrick Co.

Graphite
Dixon Crucible Co., Jos.
U. S. Graphite Co.

Graphite Paint. See Paint, Graphite

Grease, Track
U. S. Graphite Co.

Grinders, Portable
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Guard Rails
American Chain Co., Inc.
Bethlehem Steel Co.
Carnegie Steel Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Guard Rail Clamps
American Chain Co., Inc.
Bethlehem Steel Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Hammers, Chipping, Sealing and Calking
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Hammer Drills
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hammers, Forge
Sullivan Machinery Co.

Hammers, Riveting
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Hand Car Bearings
Timken Roller Bearing Co.

Head Drains, Perforated
Toncan Culvert Mfrs. Assn.

Heel Blocks
Bethlehem Steel Co.

Highway Crossings
See Crossings, Highway

Hoisting Machinery
Fairbanks, Morse & Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.

Hoists, Air Motor
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Hose
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

House Lining
Barber Asphalt Co.

Ice Cutters
Jordan Co., O. F.

Inspection Cars
See Cars, Inspection

Inspection, Engineering
Hunt Co., Robert W.

Insulated Rail Joints
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

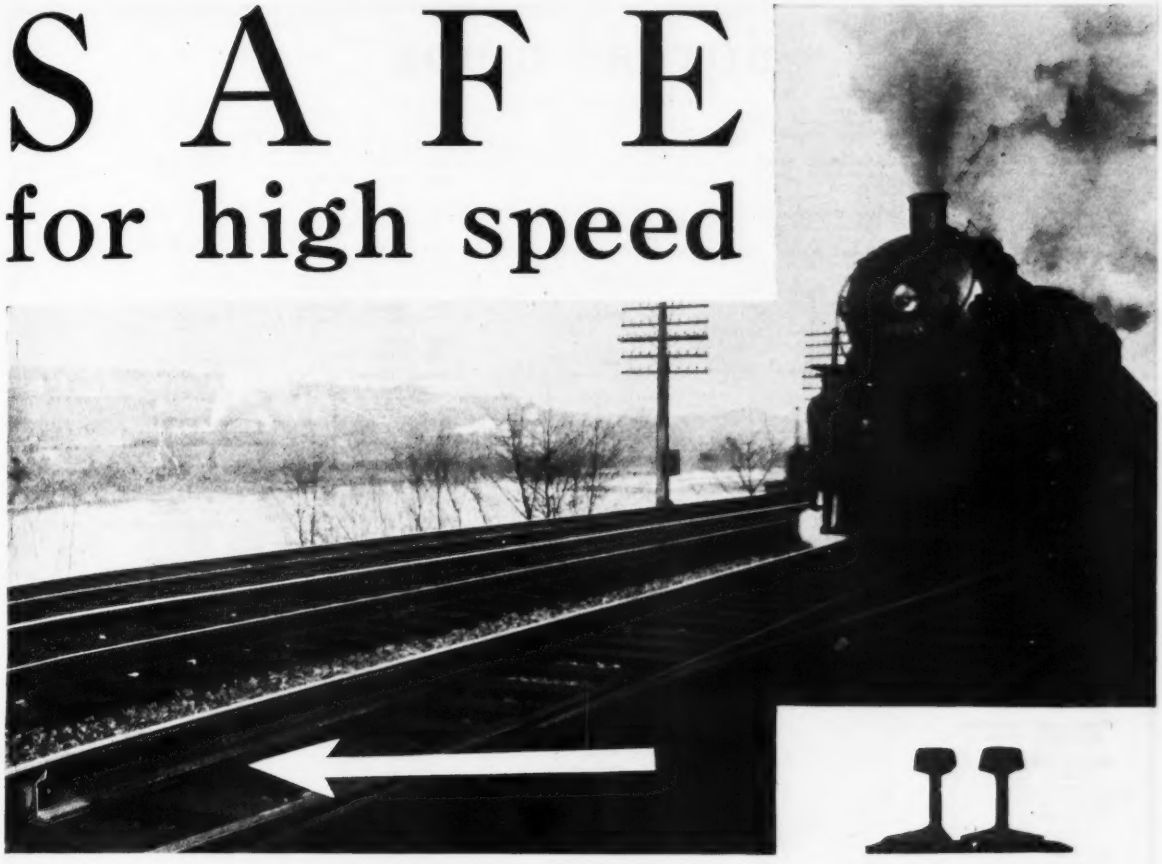
Insulating Material
Barber Asphalt Co.

Jacks, Bridge
Kalamazoo Railway Supply Co.

Jacks, Track
Kalmazoo Railway Supply Co.
Verona Tool Works

Joints, Compromise
American Chain Co., Inc.
Bethlehem Steel Co.
Q. & C. Co.
Rail Joint Co.

SAFE
for high speed



The Bethlehem Hook Flange Guard Rail is highly recommended for high speed main line service because it has sufficient resilience to allow improperly mounted wheels or unusually thick flanges to wedge through the guard rail without derailment or breakage, at the same time giving perfect protection to the frog point. This resilience is a highly important feature for high speed track.

Bethlehem Hook Flange Guard Rail is in one piece. It is complete in itself and requires no extra fittings of any kind.

Descriptive literature will be sent on request.

BETHLEHEM STEEL COMPANY, *General Offices:* BETHLEHEM, PA.

DISTRICT OFFICES

New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland
Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, Honolulu

Bethlehem Steel Export Corporation, 25 Broadway, New York City, Sole Exporter of our Commercial Products

BETHLEHEM
Hook Flange Guard Rail

BUYERS' GUIDE

Joint Fastenings
Illinois Steel Co.

Joint, Rail
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company
Q. & C. Co.
Rail Joint Co.
Wharton Jr. & Co., Wm.

Joints, Step
Illinois Steel Company
Q. & C. Co.
Rail Joint Co.

Knuckles, Emergency
Q. & C. Co.

Liners, Track
Rail Joint Co.

Lock Washers
National Lock Washer Co.
Reliance Manufacturing Co.
Verona Tool Works

Locomotives, Oil Engine Electric Driven
Ingersoll-Rand Co.

Lubricants
Dixon Crucible Co., Jos.

Lumber
Southern Cypress Mfrs. Assn.

Manganese Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Motor Bearings
Timken Roller Bearing Co.

Motor Cars
See Cars, Motor

Motors and Generators
Fairbanks, Morse & Co.

Mowing Machines
Fairmont Railway Motors, Inc.

Non-Derailer
Ramapo Ajax Corp.

Nut Locks
National Lock Washer Co.
Reliance Manufacturing Co.
Verona Tool Works
Woodings Forge & Tool Co.

Nuts
Bethlehem Steel Co.
Illinois Steel Co.

Oil Engines
See Engines, Oil

Oxygen
Oxweld Railroad Service Co.

Oxy-Acetylene Welding Equipment
Oxweld Railroad Service Co.

Paint
Dixon Crucible Co., Jos.
U. S. Graphite Co.

Paint, Graphite
Dixon Crucible Co.
U. S. Graphite Co.

Paint, Metal Protecting
Barber Asphalt Co.
Dixon Crucible Co., Jos.
U. S. Graphite Co.

Pavement Breakers
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.

Penstocks
Fairbanks, Morse & Co.

Pile Drivers
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.

Piling
Carnegie Steel Co.
Jennison-Wright Co.
Prettyman & Sons, J. F.

Pipe, Cast Iron
American Casting Co.
Central Foundry Co.
U. S. Cast Iron Pipe & Foundry Co.

Pipe, Corrugated
Armco Culvert Mfrs. Assn.

Pipe Joint Compound
Dixon Crucible Co., Jos.

Pipe, Sewer
American Casting Co.
Armco Culvert Mfrs. Assn.
Central Foundry Co.

Plants, Water Treating
Chicago Bridge & Iron Works.

Plates, Miscellaneous
Ramapo Ajax Corp.

Platforms, Station
Kentucky Rock Asphalt Co.

Plumbing Fixtures, Brass
Standard Sanitary Mfg. Co.

Plumbing Fixtures, Enameled
Standard Sanitary Mfg. Co.

Plumbing Fixtures, Vitreous China
Standard Sanitary Mfg. Co.

Poles
Jennison-Wright Co.
Prettyman & Sons, J. F.

Portland Cement
Ash Grove Lime & Portland Cement Co.

Posts, Fence
See Fence Posts

Posts, Bumping
See Bumping Posts

Power Plants, Portable
Electric Tamper & Equipment Co.
Northwestern Motor Co.
Syntron Co.

Preservation, Timber
Curtin-Howe Corp.
Jennison-Wright Co.
Prettyman & Sons, J. F.

Products, Gas
Oxweld Railroad Service Co.

Pumps, Air Pressure & Vacuum, Centrifugal, Deep Well, Piston Plunger, Rotary, Slump
American Well Works
Chicago Pneumatic Tool Co.
Fairbanks, More & Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.
United Iron Works, Inc.

Push Cars
Fairbanks, Morse & Co.
Fairmont Railway Motors Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.

Push Car Bearings
Timken Roller Bearing Co.

Rail Anchors
Bethlehem Steel Co.
Lundie Engineering Corp.
P. & M. Co.
Verona Tool Works
Woodings Forge & Tool Co.

Rail Anti-Creepers
See Anti-Creepers, Rail

Rail Benders
American Chain Co., Inc.
Q. & C. Co.
Verona Tool Works

Rail Bonds
Verona Tool Works

Rail Braces
Bethlehem Steel Co.
Q. & C. Co.
Ramapo Ajax Corp.
Wharton Jr., & Co., Wm.

Rail Expanders
Ramapo Ajax Corp.

Rail Joints
See Joints, Rail

Rail Layers
Buckeye Traction Ditcher Co.

Rail Saws, Portable
Industrial Brownhoist Corp.
Kalamazoo Railway Supply Co.
Q. & C. Co.

Rail Springs
Verona Tool Works

Rails, Girder
Bethlehem Steel Co.

Rails, Tee
Bethlehem Steel Co.
Carnegie Steel Co.

Regulators, Oxy-Acetylene
Oxweld Railroad Service Co.

Replacers, Car & Locomotive
American Chain Co., Inc.
Q. & C. Co.

Retaining Walls, Precast
Federal Cement Tile Co.

Rivets
Bethlehem Steel Co.

Rock Hammers
Ingersoll-Rand Company

Rods, Welding
Oxweld Railroad Service Co.

Roof Slabs
Federal Cement Tile Co.

Roofing, Cement & Concrete Tile
Federal Cement Tile Co.

Roofing Composition
Barber Asphalt Co.

Rules
Lufkin Rule Co.

Rust Preventive
Dearborn Chemical Co.

Saw Rigs
American Saw Mill Machinery Co.
Fairbanks, Morse & Co.

Saws, High Speed Friction
American Saw Mill Machinery Co.

Saw Mills
American Saw Mill Machinery Co.

Scales, Tape
Lufkin Rule Co.

Scales, Track
Fairbanks, Morse & Co.

Screw Spikes
Illinois Steel Company

Screw Spike Drivers
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Section Cars
See Cars, Section

Sharpeners, Rock Drill Steel
Ingersoll-Rand Co.

Sheathing Paper
Barber Asphalt Co.

Sheet Iron
Armco Culvert Mfrs. Assn.

Shingles, Composition
Barber Asphalt Co.

Shovels
Verona Tool Works
Woodings Forge & Tool Co.

Shovels, Steam
American Hoist & Derrick Co.
Northwest Engineering Co.
Harnischfeger Corp.

Siphons
Armco Culvert Mfrs. Assn.

Skid Excavators & Dredges
Northwest Engineering Co.

Skid Shoes
Q. & C. Co.

Snow Melting Device
Lundie Engineering Corp.
Q. & C. Co.

Snow Plows
Jordan Co., O. F.
Q. & C. Co.

Spikes
Bethlehem Steel Co.
Illinois Steel Co.

Spreader Cars
See Cars, Spreader

Spreaders, Ballast
See Ballast Spreaders

Standpipes
Chicago Bridge & Iron Works.
Fairbanks, Morse & Co.

Stands, Switch & Target
Bethlehem Steel Co.
Q. & C. Co.
Ramapo Ajax Corp.

Steel, Alloy
Central Alloy Steel Corp.
Illinois Steel Company

Steel Cross Ties
Carnegie Steel Co.

Steel, Electric Furnace
Timken Roller Bearing Co.

Steel, Open Hearth
Timken Roller Bearing Co.

Steel Plates and Shapes
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Steel, Special Analysis
Timken Roller Bearing Co.

Step Joints
See Joints, Step

Storage Tanks
Chicago Bridge & Iron Works.

Storm Sewers, Corrugated Iron
Armco Culvert Mfrs. Assn.

Stream Enclosures, Corrugated Iron
Armco Culvert Mfrs. Assn.

Street Culverts, Part Circle
Armco Culvert Mfrs. Assn.

Structural Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Company

Switch Guard
Ramapo Ajax Corp.

Switches
Bethlehem Steel Co.
Pettibone-Mulliken Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Switchstands & Fixtures
Bethlehem Steel Co.
Pettibone-Mulliken Co.
Ramapo Ajax Corp.
Wharton Jr. & Co., Wm.

Tampers, Tie
See Tie Tampers

Tanks & Fixtures
Fairbanks, Morse & Co.

Tanks, Elevated Steel
Chicago Bridge & Iron Works.

Tanks, Oil Storage
Chicago Bridge & Iron Works.

Tanks, Water Storage
Chicago Bridge & Iron Works.

Tapes, Measuring
Lufkin Rule Co.

Tee Rails
See Rails, Tee.

Telegraph Poles
See Poles

Testing of Materials
Hunt Co., Robert W.

Thawing Outfits
Lundie Engineering Corp.
Q. & C. Co.

Ties
Jennison-Wright Co.
Prettyman & Sons, J. F.

Tie Plate Clamps
Q. & C. Co.

Tie Plates
Bethlehem Steel Co.
Illinois Steel Co.
Lundie Engineering Corp.
Sellers Manufacturing Co.

Tie Rods
Bethlehem Steel Co.

Tie Scorer
Woolery Machine Co.

Tie Tampers
Chicago Pneumatic Tool Co.
Electric Tamper & Equipment Co.
Ingersoll-Rand Co.
Syntron Co.

Tile, Roofing
Federal Cement Tile Co.

Timber
Southern Cypress Mfrs. Assn.

Timber, Creosoted
Jennison-Wright Co.
Prettyman & Sons, J. F.

Tools, Oxy-Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Tools, Pneumatic
Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

Tools, Track
Verona Tool Works
Woodings Forge & Tool Co.

Tongue Switches
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wharton Jr. Co., Wm.

Torches, Oxy & Acetylene Cutting & Welding
Oxweld Railroad Service Co.

Track Braces
See Braces, Track

Track Cranes
Buckeye Traction Ditcher Co.

Track Drills
See Drills, Track

Track Gages
Kalamazoo Railway Supply Co.

Track Insulation
Q. & C. Co.

Track Jacks
See Jacks, Track

Track Levels
Kalamazoo Railway Supply Co.

Track Liners
See Liners, Track

Track, Special Work
Ramapo Ajax Corp.
Wharton, Jr., & Co., Wm.

Track Tools
See Tools, Track

Tubing, Seamless Steel
Timken Roller Bearing Co.

Undercrossings, Corrugated Iron
Armco Culvert Mfrs. Assn.

Ventilators
Q. & C. Co.

Water Columns
Fairbanks, Morse & Co.

Water Cranes
Fairbanks, Morse & Co.

Water Tanks
Chicago Bridge & Iron Works.

Water Treating Plants
Dearborn Chemical Co.

Water Treating Tanks
Chicago Bridge & Iron Works.

Waterproofing Fabrics
Barber Asphalt Co.

Weed Burner
Fairmont Railway Motors, Inc.
Woolery Machine Co.

Weed Killer
Chipman Chemical Engineering Co., Inc.
Q. & C. Co.

Welding & Cutting Equipment
Electric Railweld Service Corp.
Oxweld Railroad Service Co.

Welding, Electric
Electric Railweld Service Corp.

Welding, Oxy-Acetylene
Oxweld Railroad Service Co.

Well Casings
Armco Culvert Mfrs. Assn.

Wheels, Hand & Motor Car
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.
Kalamazoo Railway Supply Co.
Northwestern Motor Co.
Woolery Machine Co.

Wheels, Wrought Steel
Carnegie Steel Co.

Windshields
Fairbanks, Morse & Co.
Fairmont Railway Motors, Inc.

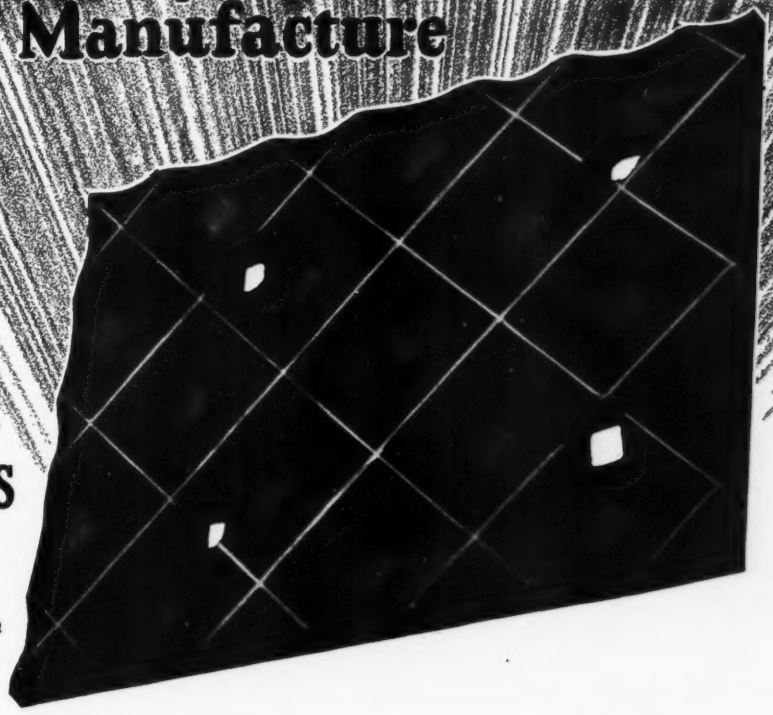
Wire Fencing
Cyclone Fence Co.

Wood Preservation
See Preservation, Timber

Wood Working Machinery
American Saw Mill Machinery Co.

Zinc-Meta—Arsenite Treatment
Curtin-Howe Corp.

A Reflection Of An Age Old Engineering Principle In Modern Tie Plate Manufacture



SELLERS
Arched Bottom
Wrought Iron
Tie Plate

10% Stronger or 10% Lighter

THERE can be no argument about the strength of an arch as compared to a flat truss containing the same amount and kind of mterial.

Likewise there is no argument about the greater strength of Sellers Arched Bottom Wrought Iron Tie Plate, compared with the flat bottom tie plates. Save 10% in metal or use the same amount of metal and have a 10% stronger tie plate—SELLERS.

SELLERS MANUFACTURING COMPANY

ILLINOIS MERCHANTS BANK BLDG., CHICAGO, ILLINOIS

ALPHABETICAL INDEX TO ADVERTISERS

A

American Casting Co. ... 55
American Chain Co., Inc. ... 52
American Hoist & Derrick Co. ... 23
American Saw Mill Machinery Co. ... 58
American Well Works ... 18
Armco Culvert Mfrs. Ass'n ... 11
Ash Grove Lime & Portland Cement Co. ... 13

B

Barber Asphalt Co. ... 55
Bethlehem Steel Co. ... 59
Buckeye Traction Ditcher Co. ... 8

C

Carnegie Steel Co. ... 15
Central Foundry Co. ... 35
Chicago Bridge & Iron Works ... 45
Chicago Pneumatic Tool Co. ... 17
Chipman Chemical Engineering Co., Inc. ... 49
Curtin-Howe Corp. ... 52
Cyclone Fence Co. ... 10

D

Dearborn Chemical Co. ... 53
Dixon Crucible Co., Jos. ... 55

E

Electric Railweld Service Corp. ... 30
Electric Tamper & Equipment Co. ... 6

F

Fairbanks, Morse & Co. ... 19-20
Fairmont Railways Motors, Inc. ... 4-5
Federal Cement Tile Co. ... 46
Foote Bros. Gear & Machine Co. ... 57

H

Harnischfeger Corp. ... 41
Hunt Co., R. W. ... 56

I

Illinois Steel Co. ... 34
Industrial Brownhoist Corp. ... 27
Ingersoll-Rand Co. ... 21

J

Jennison-Wright Co. ... 14
Jordan Co., O. F. ... 28

K

Kalamazoo Railway Supply Co. ... 64
Kentucky Rock Asphalt Co. ... 24

L

Lufkin Rule Co. ... 54
Lundie Engineering Corp. ... 3

M

Magor Car Corp. ... 53
Mechanical Mfg. Co. ... 51

N

National Lock Washer Co. ... 63
Northwest Engineering Co. ... 7
Northwestern Motor Co. ... 42-43

O

Owen Bucket Co. ... 57
Oxweld Railroad Service Co. ... 36

P

P. & M. Co. ... 1
Pettibone-Mulliken Co. ... 50
Prettyman & Sons, J. F. ... 31

Q

Q & C Co. ... 16

R

Rail Joint Co. ... 32
Railway Maintenance Corp. ... 33
Ramapo Ajax Corp. ... 48
Reliance Mfg. Co. ... 2
Richards-Wilcox Mfg. Co. ... 22

S

Sellers Mfg. Co. ... 61
Simmons-Boardman Publishing Co. ... 40-54-56
Southern Cypress Mfrs. Ass'n ... 12
Standard Sanitary Mfg. Co. ... 9
Sullivan Machinery Co. ... 57
Syntron Co. ... 39

T

Timken Roller Bearing Co. ... 38
Toncan Culvert Mfrs. Assn. ... 26

U

U. S. Cast Iron Pipe & Foundry Co. ... 25
U. S. Graphite Co. ... 54
United Iron Works, Inc. ... 51

V

Verona Tool Works ... 29

W

Wharton, Jr., & Co., Wm. ... 57
Woodings Forge & Tool Co. ... 37
Woolery Machine Co. ... 50

Greetings!

and Best Wishes for a Happy and Prosperous New Year

THE NATIONAL LOCK WASHER COMPANY

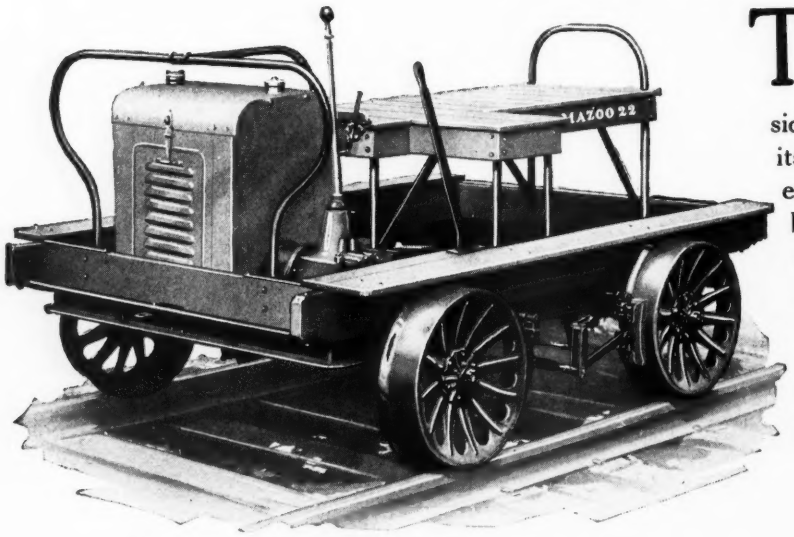
40 HERMON STREET • NEWARK • NEW JERSEY

Vital Improvements in these two 1929 Model Kalamazoo Cars

THE important improvements and refinements in these new 1929 Kalamazoo models are proving of absorbing interest to those who know railway motor cars.

A surprise is in store for the operator when he first lifts the 216-L inspection car. Its weight and balance sets up new standards of convenience and ease in handling.

Kalamazoo 216-L Inspection Motor Car—the "Safety First" one-man Inspection Car for Supervisors, Roadmasters, Signalmen, Linemen, Car Repairmen, Inspectors, Operators, etc.



Kalamazoo 22 Motor Car—safe, silent, compact, economical, easily handled, smooth running, powerful; a section motor car meeting the desires of the most critical.

THE weight of the No. 22 section car is also greatly below that considered necessary for a car of its strength and power. The engine is so placed that it balances over the front axle, making it possible for one man to handle this car also, with ease.

Those who are looking for power, dependability and the lightest possible weight consistent with ample strength and sturdiness will surely investigate these motor cars.

"Kalamazoo Means Service to You"

KALAMAZOO RAILWAY SUPPLY CO.

Established 1883

KALAMAZOO, MICH.

New York Chicago St. Louis St. Paul New Orleans Denver Spokane Seattle Portland, Ore. San Francisco
Havana London Mexico City Johannesburg Vancouver Winnipeg Montreal